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EDMUND RUFFIN, EDITOR AND PROPRIETOR.

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NOTICE OF THE ELECTRO-MAGNETIC MACHINE OF MR. THOMAS DAVENPORT, OF BRANDON, NEAR RUTLAND, VERMONT.

Many years have passed since motion was first produced by galvanic power. The dry columns of De Luc and Zamboni caused the vibration of delicate pendulums and the ringing of small bells, for long periods of time, even several years, without intermission.

In 1819–20, Prof. Oersted, of Copenhagen, discovered, that magnetism was envolved between the poles of a galvanic battery. Prof. Sweigger, of Halle, Gemany, by his galvanic multiplier, succeeded in rendering the power manifest, when the galvanic battery was nothing more than two small wires, one of copper and the other of zinc, immersed in as much acidulated water as was contained in a wine glass. The power thus evolved was made to pass through many convolutions of insulated wire, and was thus augmented so as to deflect the magnetic needle sometimes even 90°. Prof. Moll, of Utretcht, by winding insulated wire around soft iron, imparted to it prodigious magnetic power, so that a horse-shoe bar, thus provided, and connected with a galvanic battery, would lift over one hundred pounds. About the same time, Mr. Joseph Henry, of Albany, now Prof. Henry, of Princeton College, by a new method of winding the wire, obtained an almost incredible magnetic force, lifting six or seven hundred pounds, with a pint or two of liquid and a battery of corresponding size; nor did he desist, until, a short time after, he lifted thousands of pounds, by a battery of larger size, but still very small, (1830.)

This gentleman was not slow to apply his skill to the generation of motion, and a successful attempt of his is recorded in this Journal, Vol. xx. p. 340. A power was thus applied to the movement of a machine, by a beam suspended in the centre, which performed regular vibrations in the manner of a beam of a steam engine. This is the original application from which have sprung, or at least to which have succeeded, several similar attempts, both in this country and in Europe. A galvanic machine was reported to the British Association in 1835, by Mr. McGauly, of Ireland, and he has renewed his statements of successful experiments at the late meeting at Bristol. Mr. Sturgeon, of Woolwich, England, also reports a galvanic machine as being in use on his premises for pumping water, and for other mechanical purposes.*

But, I believe that Mr. Davenport, named at the head of this notice, has been more successful than any other person in the discovery† of a galvanic machine of great simplicity and efficiency. During the last two or three years, much has been said of this discovery in the newspapers, and it is probable, that in a future number of this journal, drawings and an accurate description of the machine may be given. Having been recently invited to examine a working model, in two varieties of form, and to report the result, I shall now attempt nothing more than a general description, such as may render intelligible the account I am to give.

1. *The Rotary Machine, composed of revolving electro-magnets, with fixed permanent magnets.*

This machine was brought to New Haven March 16, 1837, by Mr. Israel Slade, of Troy, New York, and by him set in motion for my examination. The moving part is composed of two iron bars placed horizontally, and crossing each other at right angles. They are both five and a half inches long, and they are terminated at each end by a segment of a circle made of soft iron; these segments are each three inches long in the chord line, and their position, as they are suspended upon the ends of the iron bars, is horizontal.

This iron cross is sustained by a vertical axis, standing with its pivot in a socket, and admitting of easy rotation. The iron cross bars are wound with copper wire, covered by cotton, and they are made to form, at pleasure, a proper connexion with a small circular battery, made of concentric cylinders of copper and zinc, which can be immersed in a quart of acidulated water. Two semicircles of strongly magnetized steel form an entire circle, interrupted only at the two opposite poles, and within this circle, which lies horizontally, the galvanized iron cross moves in such a manner that its iron segments revolve parallel and very near to the magnetic circle, and in the same plane. Its axis, at its upper end, is fitted by a horizontal cog-wheel to another and larger vertical wheel, to whose horizontal axis, weight is attached and raised by the winding of a rope. As soon as the small battery, destined to generate the power, is properly connected with the machine, and duly excited by diluted acid, the motion begins, by the horizontal movement of the iron cross, with its circular segments or flanges. By the galvanic connection, these crosses and their connected segments are magnetized, acquiring north and south polarity at their opposite ends, and being thus subjected to the attracting and repelling force of the circular fixed magnets, a rapid horizontal movement is produced, at the rate of two hundred to three hundred revolutions in a minute, when the small battery was used, and over six hundred with a calorimotor of large size. The rope was wound up with a weight of fourteen pounds attached, and twenty eight pounds were lifted from the floor. The movement is instantly stopped by breaking the connexion with the battery, and then reversed by simply interchanging the connexion of the wires of the battery with those the machine, when it becomes equally rapid in the opposite direction.

The machine, as a philosophical instrument,

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* Sturgeon's Annals of Electricity, Magnetism, &c. No. 1, Vol. 1. October, 1836.

† Mr. Davenport appears to have been strictly the inventor of a method of applying galvanism to produce rotary motion.

operates with beautiful and surprising effect, and no reason can be discovered why the motion may not be indefinitely continued. It is easy to cause a very gradual flow of the impaired or exhausted acid liquor from, and of fresh acidulated water into, the receptacle of the battery, and whenever the metal of the latter is too much corroded to be any longer efficient, another battery may be instantly substituted, and that even before the connexion of the old battery is broken. As to the energy of the power, it becomes at once a most interesting inquiry, whether it admits of indefinite increase? To this inquiry it may be replied, that provided the magnetism of both the revolving cross and of the fixed circle can be indefinitely increased, then no reason appears why the energy of the power cannot also be indefinitely increased. Now, as magnets of the common kind, usually called permanent magnets, find their limits within, at most, the power of lifting a few hundred pounds, it is obvious that the revolving galvanic magnet must, in its efficiency, be limited by its relation to the fixed magnet. But it is an important fact, discovered by experience, that the latter is soon impaired in its power by the influence of the revolving galvanic magnet, which is easily made to surpass it in energy, and thus, as it were, to overpower it. It is obvious, therefore, that the fixed magnet, as well as the revolving, ought to be magnetized by galvanism, and then there is every reason to believe that the relative equality of the two, and of course their relative energy, may be permanently supported, and even carried to an extent much greater than has been hitherto attained.

2. *Rotating Machine, composed entirely of electro-magnets, both in its fixed and revolving members.*

A machine of this construction has been, this day, March 29, 1837, exhibited to me by Mr. Thomas Davenport himself, who came from New York to New Haven for that purpose.

It is the same machine that has been already described, except that the interior fixed circle is now composed entirely of electro-magnets.

The entire apparatus is therefore constructed of soft unmagnetic iron, which being properly wound with insulated copper wire, is magnetized in an instant, by the power of a very small battery.

The machine is indeed the identical one used before, except that the interior circle of permanent magnets is removed and in its place is arranged a circle of soft iron, divided into two portions to form the poles. These semicircles are made of hoop iron, one inch in width, and one eighth of an inch in thickness. They are wound with copper wire insulated by cotton—covering about ten inches in length on each semicircle and returning upon itself, by a double winding, so as to form two layers of wire, making on both semicircles about one thousand and five hundred inches.

The iron was not wound over the entire length of one of the steel semicircles; but both ends were left projecting, and being turned inward, were made to conform to the bend of the other part; [the turned ends being parallel and near to the inside of the bend;] each end that is turned inward and not wound, is about one third of the length of the semicircle. These semicircles being thus fitted up, so as to become, at pleasure, galvanic magnets, were placed in the same machine that has been already described, and occupied the same place that the permanent steel magnets did before. The conducting wires were so arranged, that the same current that charged the magnets of the motive wheel, charged the stationary ones placed around it, only one battery being used. It should be observed, that the stationary galvanic magnets thus substituted for the permanent steel ones, were only about half the weight of the steel magnets. This modification of the galvanic magnet, is not of course the best form for efficiency; this was used merely to try the principle, and this construction may be superseded by a different and more efficient one. But with this arrangement, and notwithstanding the imperfection of the mechanism of the machine—when the battery, requiring about one quart of diluted acid to immerse it, was attached, it lifted 16 lbs. very rapidly, and when the weight was removed, it performed more than 600 revolutions per minute.

So sensible was the machine to the magnetic power, that the immersion of the battery one inch into the acidulated water, was sufficient to give it rapid motion, which attained its maximum when the battery was entirely immersed. It appeared to me that the machine had more energy with the electro-magnets, than with those that were permanent, for with the smallest battery, whose diameter was three inches and a half, its height five inches and a half, and the number of concentric cylinders three of copper and three of zinc, the instrument manifested as great power as it had done with the largest batteries, and even with a large calorimotor, when it was used with a permanent instead of a galvanic magnet. With the small battery and with none but electro or galvanic magnets, it revolved with so much energy as to produce a brisk breeze, and powerfully to shake a large table on which the apparatus stood.

Although the magnetization of both the stationary and revolving magnets was imparted by one and the same battery, the magnetic power was not immediately destroyed by breaking the connexion between the battery and the stationary magnet; for, when this was done, the machine still performed its revolutions with great although diminished energy; in practice this might be important, as it would give time to make changes in the apparatus, without stopping the movement of the machine.

It has been stated by Dr. Ritchie, in a late number* of the London and Edinb. Phil. Magazine, that electro-magnets do not attract at so great a distance as permanent ones, and therefore are not well adapted for producing motion. On this point Mr. Davenport made the following experiment, of which I was not a witness, but to which I gave full credit, as it was reported to me by Mr. Slade, in a letter dated New York, March 24, 1837.

Mr. Davenport suspended a piece of soft iron with a long piece of twine, and brought one pole of a highly charged steel magnet within the attracting distance, that is, the distance at which the iron was attracted to the magnet; by measurement, it was found that the steel magnet attracted the iron one inch and one fourth. A galvanic magnet was next used of the same lifting power, and consequently of much less weight; the attracting distance of this magnet was found to be one inch and three fourths, showing a material gain in fa-

* January, 1837.

vor of the galvanic magnet. Mr. Slade inquires, "has Mr. Ritchie's magnet been so constructed as to give a favorable trial to this principle?"* Mr. Davenport informs me that each increase in the number of wires has been attended with an increase of power.

Conclusions.

1. It appears then, from the facts stated above, that electro-magnetism is quite adequate to the generation of rotary motion.

2. That it is not necessary to employ permanent magnets in any part of the construction, and that electro-magnets are far preferable, not only for the moving, but for the stationary parts of the machine.

3. That the power generated by electro-magnetism may be indefinitely prolonged, since, for exhausted acids, and corroded metals, fresh acids and batteries, kept always in readiness, may be substituted, even without stopping the movement.

4. That the power may be increased beyond any limit hitherto attained, and probably beyond any which can be *with certainty* assigned—since, by increasing all the members of the apparatus, due referance being had to the relative proportionate weight, size, and form of the fixed and moveable parts—to the length of the insulated wires and the manner of winding them—and to the proper size and construction of the battery, as well as to the nature and strength of the acid or other exciting agent, and the manner of connecting the battery with the machine, it would appear certain, that the power must be increased in some ratio which experience must ascertain.

5. As electro-magnetism has been experimentally proved to be sufficient to raise and sustain several thousands of pounds, no reason can be discovered why, when the acting surfaces are, by skilful mechanism, brought as near as possible, without contact, the continued exertion of the power should not generate a continued rotary movement, of a degree of energy inferior indeed to that exerted in actual contact, but still nearly approximating to it.

6. As the power can be generated cheaply and certainly—as it can be continued indefinitely—as it has been very greatly increased by very simple means—as we have no knowledge of its limit, and may therefore presume on an indefinite augmentation of its energy, it is much to be desired that the investigation should be prosecuted with zeal, *aided by correct scientific knowledge*, by *mechanical skill* and by *ample funds*. It may therefore be reasonably hoped, that science and art, the handmaids of discovery, will both receive from this interesting research, a liberal reward.

Science has thus most unexpectedly, placed in our hands a new power of great but unknown energy.

It does not evoke the winds from their caverns; nor give wings to water by the urgency of heat; nor drive to exhaustion the muscular power of animals; nor operate by complicated mechanism; nor accumulate hydraulic force by damming the vexed torrents; nor summon any other form of gravitating force; but, by the simplest means—the mere contact of metallic surfaces of small extent, with feeble chemical agents—a power every where diffused through nature, but generally concealed from our senses, is mysteriously evolved, and by circulation in insulated wires, it is still more mysteriously augmented, a thousand and a thousand fold, until it breaks forth with incredible energy; there is no appreciable interval between its first evolution and its full maturity, and the infant starts up a giant.

Nothing since the discovery of gravitation and of the structure of the celestial systems, is so wonderful as the power evolved by galvanism; whether we contemplate it in the muscular convulsions of animals, the chemical decompositions, the solar brightness of the galvanic light, the dissipating consuming heat, and, more than all, in the magnetic energy, which leaves far behind all previous artificial accumulations of this power, and reveals, as there is full reason to believe, the grand secret of terrestrial magnetism itself.

B. S.

New Haven, March 31, 1837.

* This question I am not able to answer, as I have not seen any account of the apparatus or of the experiment, but only of the result.

From the New England Farmer.

REMARKS ON SILK CULTURE AND MANUFACTURES.

I send you some few notes relative to silk and its culture, and the sugar-beet. The progress making in both these branches in France and other countries at the present day, offers new encouragement. By continued perseverance, which is one of the most distinguishing traits of the American character, we have the assurance of success, and in the end it is expected that these two branches will constitute to the northern and middle states of the Union, a mine of inexhaustible wealth.

The production of food and of clothing, are the two most important sources of wealth to a nation. Silk and sugar-beet are the two all-engrossing topics which have engaged the attention of the French nation of the present day, as I am assured by a letter of a very late date, from the most authentic source in that country. The stock of the Chinese mulberry is exhausted in the vicinity of Paris, and its price has risen to more than double what it was last year. Such has been the increased demand and reputation of this plant of late; and even the seed of the white mulberry commands at Paris, a price of 60 francs a pound. Of these facts I am very lately assured by the Chevalier Soulange Bodin, whom I consider the best authority in France.

Italy is advancing, though now in the rear, if we may believe all accounts. Aided as they are by the exertions of M. Bonafoux, they must advance in time. The silk culture, by the aid of the present enlightened Pacha, is also, from all accounts, making considerable advances in Egypt.

I shall endeavor to prove that the comparative high price of labor in America, offers no discouragement. The zeal and enterprise of our people will enable them to overcome all obstacles; the difference in the price of labor must be measured according to the amount of labor performed, and the talent and ingenuity which are brought into action.

The improved *power looms* for weaving silk of the most perfect construction, are of American invention. The experiment has since been tried in England but with only partial success. I have seen Gray's power looms at Nantucket, for weaving plain silks, which can weave pongees at the rate of 2½ inches in a minute, and of the most perfect manufacture. Ordinarily however, they seldom come up to this speed. A woman can tend two looms. The President of that company (the Atlantic Silk Company,) to whom the public are greatly indebted for his unwearied perseverance, has lately assured me that their success in the manufacture exceeds his most sanguine expectations.

Last summer, S. V. S. Wilder, Esq., called on me—a gentleman of great intelligence and the strictest veracity—who owns a very large farm in a neighboring town, though principally he resides as a merchant in the city of New York. He appeared anxious that the people should begin aright. On his farm he is setting out the mulberry on the hills, and from his extensive observations and knowledge of the silk business, in which he was constantly engaged during a residence of twenty-two years in France, he is confident that the hills and uplands are best suited to the mulberry. This confirms my previous statements. He observes, to his certain knowledge, that in low grounds and near ponds and meadows, the leaves are liable to become spotted and mildewed, and if given to the insects, are the sure sources of disease.

These low grounds are moreover exposed to the destructive frosts of winter, and [heat?] of summer, and are better adapted to the growth of the sugar beet.

He relates an account of the growth, progress, and profits of an orchard of mulberry trees, set out by a crape manufacturer, and a friend of his, of Lyons, at Fontaine, about fifteen miles from Lyons, about the year 1807. He was invited by his friend to visit this plantation at its formation at that time. Here were 60 French acres, (about 75 English acres) just set out with mulberry trees at the rate of 200 trees to the French acre. Six years after, he was invited by his friend to visit this plantation again, and was then informed that he had just sold the leaves on the whole plantation for one franc for each tree, or about $2,000 for the whole, to the gatherers. These are another class, who come, sometimes even from remote sections, with their whole families in wagons, and well provided with the essential means of purchasing the leaves on the trees, and with every needful requisite for making silk; shantees or sheds however are usually provided by the owner, and special provision is made in the contract, that the leaves of the tip ends of the twigs shall always be preserved to retain the sap and preserve the vigor of the tree. About four years afterwards, by invition, Mr. Wilder made another visit at this plantation from Lyons to Fontaine. The crop had at that precise time, just been sold on part of the plantation at three francs per tree. About seven years after, Mr. Wilder being again invited by his friend to visist the same plantation at the epoch of gathering the leaves, he found that the whole crop, from 10,000 trees had been sold to the gatherers, on the trees, for five francs per tree, or about $10,000 for the whole. And this plantation bids fair to produce an equal or superior amount of foliage for a long series of years.

It must be remarked however, that the price of leaves varies somewhat in different years, and is governed in some measure by the demand for silk. This amount of produce may be regarded as a great estate to the fortunate possessor, in a country like France, where a man may live independent and comfortable on one half the income which would be required in America or in England. It is stated that many of the English go to France, and especially to Paris, there to reside on account of the cheapness and economy of living.

Mr. Wilder states it also as a fact, which long experience has proved in France, that more pasture is produced beneath the shade of the mulberry trees, than in the open ground. All the reason for this, which I can assign, is, that the roots of the mulberry tree strike downwards; other plants may therefore, with reason, grow well beneath its shade, especially those whose roots do not descend deep; besides the tree serves during summer to protect the surface from the scorching sun.

This mode of raising the mulberry tree is exceedingly simple, but evidently it is not that which is most approved at this day, either in France, in Turkey, in China, or in India. The system of raising them in hedge-rows, seems now the most of all approved. And even in Italy, at this day, Bonafoux, the director of the Royal Gardens at Turin, and the celebrated writer on silk, whose translated works are so well known with us, has recommended hedge-rows, and has made extensive experiments, and his authority I deem equally high as that of the celebrated Dandolo, whose disciple he was, and especially as his writings are of a more recent and of a later date.

John P. Cushing, Esq. a gentleman who has resided many years in China, has stated that the most approved mode of cultivating the mulberry, as practiced in many parts of that ancient and extensive empire, consists in keeping them low by annual prunings, like plantations of raspberries. This system has, at a late date, attracted the attention of M. Bonafoux, and has been adopted in practice and highly recommended by him. In an article which I find recorded in the Annales de l'Institut Royal Horticole de Fromont, vol. iii. pp. 341 to 348 inclusive, this celebrated writer and master of the art recommends the practice of raising mulberries in low plantations, and in close and compact order, as in China, or as he terms it, in *prairies*. The Chinese mulberry, *morus multicaulis*, or as he terms it, *M. cuculata*, had early attracted his attention after its first introduction to France, from the peculiar luxuriance of its growth and produce, the extraordinary size of the leaves, and the facility with which they are renewed, the facility also, by which it is increased from layers and from cuttings. He adds, "we can say with assurance, that the mulberry of the Phillippines, [of China] is not more sensible to the cold of our countries, than the white mulberry." He then proceeds to state, that in the memorable winter of 1830, which was one of unexampled severity, the branches were indeed destroyed at their summit, as were also those of the common species; but they failed not to re-establish their growth in a short space of time.

M. Bonafoux speaking further of the merits of

the new plant, proceeds to say: "The advantages being already stated, it remained only to examine how far the leaves possessed the qualities requisite for the nourishment of silkworms. I made therefore, two comparative experiments in the education of the silkworms, numbers and all circumstances in the two cases being equal. The worms fed constantly with the *morus cuculata* [*multicaulis*] consumed rather less in quantity than was consumed by the worms which were fed altogether with the *murier blanc*, [white mulberry,] and I obtained from each, several thousands of cocoons, which offered no perceptible difference in regard to strength of fibre, fineness, or weight."

M. Bonafoux found that a *journal* of land of Piedmont, set out in close order, or in prairie, with 5000 cutting of *morus multicaulis*, produced about 50 quintals of leaves in the the second year; while it would have required, at least 100,000 plants of the white mulberry, of one or two years growth from seed, to produce the same quantity of food on the same ground. In the third year, the same plants, on that same ground, produced him about 100 qnintals of leaves, and he supposes that in a very short period after, the quantity produced on the same journal of land would be increased to 200 quintals, and that this might be the maximum. The *journal* of Piedmont is 100 *tables*, or about a third of a French *hectare*, or about 8-10 of an English acre. Thus, according to this calculation, an English acre would soon produce 25,000 lbs. of leaves, enough with the best management and the strictest economy in feeding and reeling, to produce 312 lbs. of silk. Again, the plan he proposes is to raise the plants from cuttings, the first year in close order. And in autumn, or early in the following spring he recommends to set the plants in rows two or three feet asunder, and a foot and a half distant in the row. And he moreover, particularly directs to set the plants eight or ten inches deep at least, as thus they will throw out new and more abundant and numerous roots on every side.

These plants are shortened down to near the surface of the ground early in spring, to make them throw up new and numerous shoots of the most luxuriant growth, five to seven feet. The ground during summer to be kept cultivated, and the plants in the spring to be annually pruned down. M. Bonafoux recommends cuttings of five or six inches, each furnished with three or four eyes. In this he is right, as cuttings of this length are sure to live. Usually, with us, but two eyes are left to each cutting, from motives of economy; but when an early and severe drought occurs, and before the cuttings have time to take root, the danger of a total loss by reason of the short cuttings becomes great, except only in moist grounds.

After being cultivated in this mode for fifteen or twenty years, he has recommended to take up the plantation, to clear the ground of all roots, and to cultivate with vegetables for one or more years, new plantations being formed in the meantime.

Among the advantages enumerated by him, which this mode promises to cultivators, and especially when they employ the new mulberry, *morus multicaulis*, in preference to the white mulberry, are the following: 1. The winds have less power or action on the trees. 2. A less depth of soil is requisite than for standard trees. 3. Women and children may collect the leaves without danger, and with much greater facility and promptitude than from large trees. 4. The vegetation of the mulberries will be earlier in the prairies, and by reason of this the worm may complete their labors before the greatest heats of summer. 5. The absence or scarcity of fruit will facilitate the gathering of the leaves; which will not be soiled, to the injury of the insects when consumed, or by causing fermentation in the litter. 6. This early vegetation of the mulberries, and the promptitude with which their foliage is renewed, may render it possible to make two successive crops in a year, without sensibly injuring the vigor of the plant, which will again recover a new crop of leaves before winter.

In fine, this culture offers at the same time an increase of production; diminution of expence; economy of land; and to all these and other advantages which M. Bonafoux has enumerated, I also will add, that the economy in time is another very important consideration, as the plantations in this mode are sooner rendered productive, than from trees at an extended distance. Thus the prolonged and expensive outlay is saved, and the tedious cultivation of many long years.

With regard to the white mulberry, I will suggest the opinion that only one crop of leaves can probably be gathered in our climate in a season; its growth being slow, a second crop would too much exhaust the tree, but in warmer climates as in Tuscany, two crops may be obtained even from that tree in the same season. As to the Osage orange, I have urged last summer, on some at Philadelphia, that trials should be made of the leaves, by feeding the silkworms exclusively on them alone, throughout their various mutations. But though I understand that the worms eat them with avidity, they were not fed with them exclusively, and I cannot yet learn that the decisive experiment has been fairly tried. The tree seems perfectly hardy on my hill. where it has stood uninjured and unprotected during eight years. Yet though I believe it to be full as hardy as the mulberry, I am informed on the best authority, that in the valley of the North River and at Albany, and in the same latitude as with us, that the maclura or Osage orange is almost invariably destroyed down every winter, as are also some other hardy trees; a proof that that climate during winter, is very different from ours. That climate, however, must be equally as well suited as ours to the cultivation of our sugar-beet.

The progress of Italy, as I before stated, is slow in every advancement. Their country is old and their people still wedded to old customs, and badly governed by a combination of temporal and spiritual rulers; their people, harassed and oppressed and discouraged, need only a new and more thorough regeneration. Though the daily wages of labor are far less in Italy than they are in our own country, still it must be admitted that the spirit by which, alone, man is inspired to the most heroic labors, is wanting there. Thus in Piedmont, according to Dr. Lardner, and where the original throwing machines for silk were first invented in former centuries, they are still content if the spindles to their machines do but revolve from 300 to 400 times in a minute. It was the same of late in France. But now those of the British in their throwing machines revolve 1800

times a minute; and will revolve, working well, at 3000 in the same space of time. And lately, Ritson has made them revolve 4000 times. Now, let us look at the still greater improvements of America. Our spindles for spinning cotton, which work on the same principle as the spindles of the throwing machines of Piedmont, are made to revolve, working well, at the rate of about 5000 times in a minute. And the following important evidence has been kindly furnished me by Dr. Hobbs, the agent of the Waltham manufacturing company. Twenty years ago, the Waltham factory put out all their cotton yarn to weave in private families; and the price they then paid for weaving No. 14 cotton yarn, into cloth 37½ inches wide, was from eight or ten cents a yard, which is fully equal to the average price which the same goods have sold for the last five years. Now by improvements in the *power looms*, the cloth of the same kind and quality is wove for ⅜ of a cent a yard; and a girl will tend two looms, and occasionally three, and each loom will weave, of this same quality of cloth, from forty to forty-five yards in a day of twelve hours. The improvements in spinning at these factories are even as great at this day, and far before all other times and countries. A girl now tends 246 spindles, which will spin 1,300,000 yards of No. 14 yarn in a day of twelve hours, (equal to about 733 miles) which is equal to 1548 hanks, or 110 lbs. To do this twenty years ago, in a day of twelve hours on hand machines, would have required 500 girls. Now, not only in manufactures of cotton, but in many other articles of manufacture we are able, quality considered, to undersell not only Britain, but any other nations, even in their own markets.

It has been remarked by the Baron Charles Dupin, who is deemed high authority for his sagacity and distinguished researches into all subjects connected with questions of commercial and political interest, that in all the most important branches of manufacture, a superiority the most decided has been attained by those people with whom labor bears a higher price than with their rivals. He instances, in proof, the cotton manufactures of England, which are afforded both cheaper and of better quality than by any other people of Europe, although the price of labor is dearer in Great Britain than in any other country of the eastern world. Also, he instances the manufacture of linens, in which the Dutch and the Belgians surpass and undersell the Bretons, although the price of labor is higher in Holland and Belgium than in Brittany. Furthermore, he has also shewn, that in the production of fine woollens, France surpasses and undersells Spain, although the price of labor is higher in France than in the latter kingdom.

The striking superiority in these instances; is ascribed by him to higher attainments in mechanical ingenuity and skill, and a more eminent degree of commercial knowledge and enterprise.

On a careful investigation, it will usually be found that the apparent difference in the price of labor between different countries is rather nominal than real; and in those countries where labor is higher in regard to price, there the greatest encouragement is always offered for the exercise of the ingenuity of man, in curtailing and diminishing its amount in every possible mode. Sufficient and ample evidence of this imporant fact is taking place daily, and before our own eyes, and in our own country.

WILLIAM KENRICK.

Nonantum Hill, (Mass.) March 17, 1837.

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BURNT CLAY.

THE burning of clay, for manure, is an invention which has been attributed to the Earl of Halifax, and is supposed not to have been adopted in England until about the year 1780; but it was known in this country at a far more distant period, and has been mentioned in some very old tracts on agriculture, in one of which, published more than a century ago, under the title of 'The Practical Farmer, or the Hertfordshire Husbandman,' the method of preparing and applying it to the land is described in a manner which differs but little from the present practice. In 'The Country Gentleman's Companion,' printed in London in the year 1732, there are also two engravings of kilns for burning clay, with several letters from various persons, stating that the plan had succeeded in many places in both England and Scotland; and that, in experiments made in the latter country, it had been found preferable to either lime or dung, but too expensive, In the north of Ireland it has also been carried on time out of mind, and in the vicinity of the bogs, where fuel is accessible, the the manure which it affords is cheap and inexhaustible, and the power of cropping is thus extended beyond what could otherwise be practicable*. An essay has been written by Mr. Burroughs, describing its good effects in very warm terms: many other treatises have likewise been published upon the subject; and the gold medal of the Society of Arts was, not many years since, awarded to Dr. Cartwright for his experiments.

The practice, however, fell into considerable disuse, until it was revived, in the year 1815, by some letters in the 'Farmer's Magazine,' and, still more recently, by the account given by General Beatson of the process, and its consequences, on his farm in Sussex, in which he describes the efficacy of calcined clay, when compared with either lime, dung, wood-ashes, or peat and dung, as equal, and in some instances superior, to any of those manures †. This has been followed by two other publications,—one at York, and the other at Ipswich ‡,—each nearly supporting the same principle by arguments drawn from practical proofs: and it seems to have been, in many cases, sanctioned by the experience of extensive farmers, of which we shall here state some instances.

Experiments.

A turnip-field was manured by Mr. Craig, of Cally, in Gallowayshire, partly with rotten stable-

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* Curwen's Observations on the State of Ireland, vol. i. p. 57.

† See 'A New System of Cultivation, without lime, dung, or summer fallows, as practised at Knowle Farm, in the County of Sussex;' by Major General Alexander Beatson. Second Edition, p. 21.

‡ 'Cheap manure, produced by the newly-discovered Methods of Burning Clay;' Anon. York. Second Edition, 1822; and 'Practical Hints on Burning Clay, &c.: by Charles Poppy. Ipswich, 1830.

dung, and the remainder with the ashes of burnt clay. The seed, which was of the yellow field sort, was sown on the same day, but that on the ashes sprang up the earliest, was the most vigorous during the season, and the spring crop was far superior to that produced by the dung, or any thing of the kind in the neighborhood. A following crop of Swedes was calculated to weigh fifty-two tons,—equal to about *forty tons per English acre*,—including tops and tails; but, as they grew in the centre of a preserve, the greater part of the tops were stripped off by the pheasants, and some of the roots were eaten by hares.

A friend of this gentleman, an extensive farmer, though it was late in the season when he sowed his turnips, yet obtained a premium from the Agricultural Society of the Stewartry, and the first prize of the Highland Society, for twenty acres manured with clay ashes, at the rate of forty-five cart-loads per acre; which he however afterwards reduced to thirty loads, and declared himself so satisfied with the result, that, although his farm was only a mile and a half distance from Kirkcudbright, yet he would not be at the trouble of carting dung from thence, even if he could get it for nothing *!

Burnt clay, also, when applied to turnips, on a farm consisting of stiff clay, in Annandale, at the rate of sixty cart-loads per acre, produced a better crop than dung upon the same land; and, when succeeded by barley, no difference was observable in the produce. The cost, in 1818, never exceeded sixpence per single cart-load for the labor and expense of burning, exclusive of that of cartage, and in some seasons did not amount to more than threepence or fourpence. *

Mr. Curwen also states, about the same time, that he had made 2,000 single cart-loads of ashes from burnt clay on his farm in Westmoreland, and had raised from them fifty acres of Swedish turnips fully equal to those largely manured with good dung. †

Major-General Vavasour, of Melbourne Hall, near Pocklington, in Yorkshire, having a large farm of a strong clay soil thrown upon his hands in a very impoverished state, commenced the practice of burning clay, and manured one half of a field with ashes at the rate of twenty solid yards, or about twenty-five tons per acre; the other half with fifteen tons of dung; and the former was decidedly the best crop. The same result has been experienced in corn crops upon the same farm, and land which had been laid down with seeds, and top-dressed with clay ashes, became uncommonly luxuriant ‡. On the Wolds, in the East Riding, twenty to thirty cubic yards are also said to have been found equal to from eight to twelve tons of good fold-yard manure, when used for wheat and for every kind of green crop. §

These experiments, it will be observed, were made solely in comparison with unequal quantities of clay ashes and yard dung; but those of Dr. Cartwright were carried on comparatively with the ashes of clay at the rate of 400 bushels per acre, 100 of those of wood, and 50 of soot, laid upon an equal portion of cold, wet, tenacious land, without any top-dressing, and applied to different crops, of which the following was the produce:—

	Swedish turnips.	*Kohlrabi.*	*Potatoes.*	*Barley.*
Burnt Clay	25 tons 2 cwts.	6 tons 17¼ cwts.	480 bushels.	4 qrs. 4 lbs.
Wood-ashes	23 12	3 18¼	456	4 2
Soot	16 12½	4 17¼	432	4 2
No top-dressing.	10 4	4 7½	340	3 0

It thus appears that in each of these the burned clay displayed a superiority; the disparity between the turnips which were top-dressed, and those which had not that advantage, is partly attributed to the protection thus afforded to the young plants from the fly; but it is difficult to account for the extraordinary deficiency in the produce of the kohlrabi, spread with wood-ashes, when compared with the part left without manure. The Doctor says, 'that he had no convenient way of judging the experiments on grass-land, but by the eye, yet that, so far as that enabled him to judge, the burned clay was without question superior; and the soot, as in all the other trials, except the last, was evidently more powful than the wood-ashes.' The quantity, indeed, of clay-ashes was greater; but the expense he only calculates at 15s., while that of the wood-ashes and soot cost in each instance 50s.: though on this it should be remarked that the charge of spreading, and probably of cartage, must have been greater in the former case than in the two latter. †

Mr. Burroughs, after detailing the difference in the chemical qualities of burned earth, in the essay to which we have already alluded, and to which we shall hereafter refer, says that 'lime being established as a valuable application to many soils, it would be no easy matter to persuade those who have not tried the former as a substitute, that it possesses more fertilizing properties; but, then, experience, by which all must be governed, has convinced me that burned earth is by far more valuable, on many soils, than lime. I have tried it on *strong clays*, on *light soils*, and on *moory soils*, on all of which it produced good crops of potatoes and turnips, and afterwards corn; and in one instance in particular, where lime had been ineffectually applied, a dressing of burned clay made the land yield most abundantly. Lime only stimulates and pulverizes the soil, whereas burned earth not only possesses those properties, but contains within itself enriching and vegetative qualities.' In proof of which he gives the following facts :—

1. A wheat stubble, on a light sandy loam, gravelled as a preparation for that crop, was sown with barley in the following spring; the land being

* Farmer's Magazine, vol. xvi. pp. 138, 139.

† See the Transactions of the Society of Arts, vol. xxxvi.

* Ibid., vol xix. p. 279.

† Ibid., vol. xvii. p, 429.

‡ The men contracted to burn the ashes at 8½*d.* per cubical yard, making the walls and carrying the wood and clay to the kilns. This was in 1816, when wages were at about the present rate.

§ Farmer's Magazine, vol xviii. p. 383; and vol. xx. p. 154.

winter fallowed, and in good tilth: part of the field was dressed with burned clay, and part with lime and clay compost. The crop was sown and treated on both parts alike, but that portion of the ground to which the burned earth was applied produced by far the best quality of grain, and also a larger quantity to the acre.

2. On a moory field, prepared for a potatoe crop, a heavy dressing of strong clay and lime compost was laid on, as the land was not considered sufficiently strong to take pure lime with advantage; part of the field remained undressed till the middle of May, when it was manured with burned earth, which was dug from the headland, and the crop was better than where the compost had been applied.

He then adds, that 'burned earth may be depended upon as manure fit to preduce abundant turnip crops, of every description, on a variety of soils; even the Swedes, so difficult to grow on light land, will prove a more luxuriant crop with this manure than with farm-yard dung, and are less liable to be cut off by the fly. It may be supposed by some that any crop sown on this manure would be precarious in dry seasons, not containing, as they may conceive, any enriching quality or properties to preserve moisture: but this is by no means the case, for it will be found that an application of burned earth makes the land on which it is applied more capable of absorbing moisture from the atmosphere; and, by minutely dividing the soil, the roots of plants can search more freely for nourishment. I have often observed that farm-yard dung, unless very well prepared, does not, in excessive dry seasons, supply sufficient moisture to the roots of plants; and that, during such seasons, crops, sown on ashes, or burned earth, have uniformly thriven, while those in dunged land have gradually declined. *

General Beatson's farm—which consists of 300 acres, 120 of which are arable—was managed for some years previous to his death under an entirely novel system of culture, respecting the details of which we purpose giving some account in a future portion of this work; for although it has been only slightly followed in a few instances, there is yet much of his practice which merits consideration, and every new plan, which is not decidedly proved to have failed, may be fairly deemed entitled to candid investigation. The plan on which it had been previously conducted was so unprofitable, that he had determined on abandoning the farm altogether, when his attention was attracted to a small enclosure, where he had four burnt clay experiments, around which was a space unmanured, and beyond it all the rest of the field manured with rotten dung at the rate of forty loads per acre, the whole carefully scarified, harrowed, and drilled, exactly in the same manner. Those clay experiments not only maintained a very striking superiority during the growth of three sucessive crops—the first being a mixture of tares and oats, and the second and third wheat; but were also perfectly clean, whilst the dunged part was absolutely choked with weeds; they had each respectively at the rate of ten, twenty, thirty and forty cart-loads of the ashes per acre. This gave rise to his subsequent practice, which, according to his account, he continued with complete success for upwards of six years, during which time the entire of his arable land was manured with the ashes of burnt clay, his farm dung being solely applied to his hop-grounds, and a few acres of potatoes.*

*'Essays, on Practical Husbandry,' by Edward Burroughs, Esq., No. 11, p. 75.

Analysis.

The term *'burned earth,'* may be understood as implying any species of soil capable of being dried up by excessive heat. Moory and light sandy soils, being deficient in tenacity, cannot, however, be so applied with advantage; but clay, of all sorts, and strong loams, are well adapted to the purpose. It has, however, been observed by Burroughs, 'that this mode of preparing earth, as a manure, is upon a principle very different from that of reducing it to ashes; and though the effect produced on the land to which it is applied may be apparently the same, yet the torrefied,' (dried by fire, or scorched) 'substance is by far more permanent. The chemical difference in their preparation is this:—In reducing the soil to ashes, much of its fertilizing properties are dissipated, and its vegetable matter destroyed; but when only torrefied, those properties are preserved, and its vegetable matter only reduced to a state more valuable as the food of plants.'

'There are two sorts of burned earth,—1st, that which is obtained from the surface, of which we have already treated; and, 2ndly, that which is dug from the subsoil.' 'Subsoil, calculated for this purpose, may be said to be of two kinds, viz: adhesive clay, and calcareous earth: the former seldom possessing any fertilizing properties in its natural state; but the latter is even in that state, generally a valuable substance. As alternatives to the soil, they may be good applications, if appropriately applied, and may produce fertility accordingly; but by putting them through a process of torrefaction, however, naturally deficient in fertilizing properties, they can be converted into valuable manures. †

Mr. Naismith also says, 'that when cohesive earth has undergone this operation, and is afterwards reduced to powder, all its tendency to coherence is lost, and its particles lie compact, without uniting. It seems to have the perfect consistence of a fertile soil; for corn springs quickly, and tillers abundantly on it; and if a little dung-juice be given from time to time, it will grow luxuriantly to maturity. It has also a strong tendency to promote fertility when applied to other soils; and even a very slight torrefaction of the soil has a great effect. ‡

*He says that his wheat yielded a return of twelve for one of the seed; or 33 per cent better than the usual return in his vicinity, which, upon an average, is only 20 bushels per acre from 2½ bushels, if drilled, and 3 if sown broad-cast. New System, &c. second edition, pp. 82 and 108.

† Essay, No. 11, on Manures, p. 62,

‡ Essay in vol. ii. of the Appendix to the Gen. Rep. of Scotland, p. 95. In his Elements of Agriculture, he also says, 'the powder of burned clay lies always in that happy medium between cohesion and repulsion of the particles, which is best adapted to give admission to the roots of vegetables,'—p. 340.

Effects of burnt clay.

From this we should be led to conclude that a very material difference would be found to exist in earth thus merely dried; for there can be no doubt that its properties must depend upon the quantity of vegetative matter which it contains. But it is difficult to draw the line between this process of torrefaction, and that which consists in burning the earth to ashes; for if the clay be merely dried, the next rains will reduce it back to its former state, by which the soil cannot be benefited; and if the fire be advanced to a degree much stronger, it will probably have the effect of consuming the earth to ashes, in the qualities of which no perceptible difference will be found. In the latter state, indeed, we are strongly of opinion that its effects are purely mechanical—acting upon heavy soils merely by correcting their tenacity, and rendering them less stubborn; but this will doubtless contribute greatly to their fertility, though it cannot be considered as a nutritive manure.

The stress which has been laid upon the supposed value of some kinds of burned clay, in consequence of the calcareous matter contained in the subsoil, is probably over-rated; for it is seldom found, in soils of that description, in such abundance as to be of much service as a manure to other lands. We learn, indeed, from an experiment of General Beatson, that when even the surface-soil has been burned, no difference was found between the effects of that, although containing vegetative matter in the sward, and the ashes of common clay; though the quantity applied was perhaps too small to warrant any positive conclusition *. We, therefore, think that the ideas which have been entertained of the effects of this manure, are rather too sanguine; and we are decidedly of opinion that the expectations of those of its advocates who imagine that 'burnt clay will surpersede the dung-cart' will be disappointed. It appears, indeed, from a more recent essay by Mr. Burroughs, on the cultivation of white crops, that he has not been so well satisfied of its good effect as to persist in its use instead of farm-yard manure; for although we there find him recommending the use of the latter, he yet makes no allusion to burned clay. In Scotland, also, where the burning of clay was a few years ago very extensively practiced, we learn that it has since fallen into considerable disuse. There can however be no doubt that clay ashes may be beneficially used; but it does not appear from past experience that they can preclude the use of lime on soils not formerly dressed with it.

We make no apology for the length of these extracts, for the subject is of great importance, and although we entertain doubts of the accuracy of the inferences drawn from the experiments by some writers, yet that should not prevent any farmer who possesses the means of satisfying himself by similar trials, from ascertaining their effect by actual practice. It is true, that the nature of some soils does not admit of it; in others, the land is in many cases so valuble, that almost every inch of it is in profitable use; and as it requires about 150 square yards of surface, six inches deep, for a single acre, or a pit of proportionate size, if dug from the subsoil, many persons will naturally grudge the sacrifice; though banks and headlands —something, in short, in the shape of waste— may be found on every farm. Every one who has the opportunity should give it a fair trial; and if the result should prove its efficacy, it may then indeed, be considered 'as opening a new field to the prosperity of agriculture.' The following are the most approved methods of preparation, when pits are dug from the subsoil; but if the earth be taken from the surface, then those directions will be applicable which have been already given in the previous chapter; under the head of 'Paring and Burning.'

Clay-kilns.

There are two modes of burning clay commonly employed, one by kilns partly constructed of masonry, and the other of sods; in both of which the earth is piled upon them, instead of being placed under cover, as in a lime-kiln.

The kiln of the former kind, described by Mr. Burroughs, should be built in a pit excavated out of the ground which is to be burned, and consists of an arch about four or five feet long, three wide and two high, made with brick; the front close like an oven, and the inside fitted to receive a strong fire of coals. On the top of the arch six or eight holes are left, the size of a small brick, to admit the heat passing out, which is to communicate to the earth laid on. When the fire is sufficiently strong, the door of the kiln is to be well stopped and the earth thrown on in some degree pulverized, about six or eight inches thick, so as to cover the top of the kiln, and every direction round it to which the heat might communicate. In this manner it is to be dressed alternately with culm and earth, which are to be laid on according to the heat of the fire, which is on no account to be allowed to burn too strong.

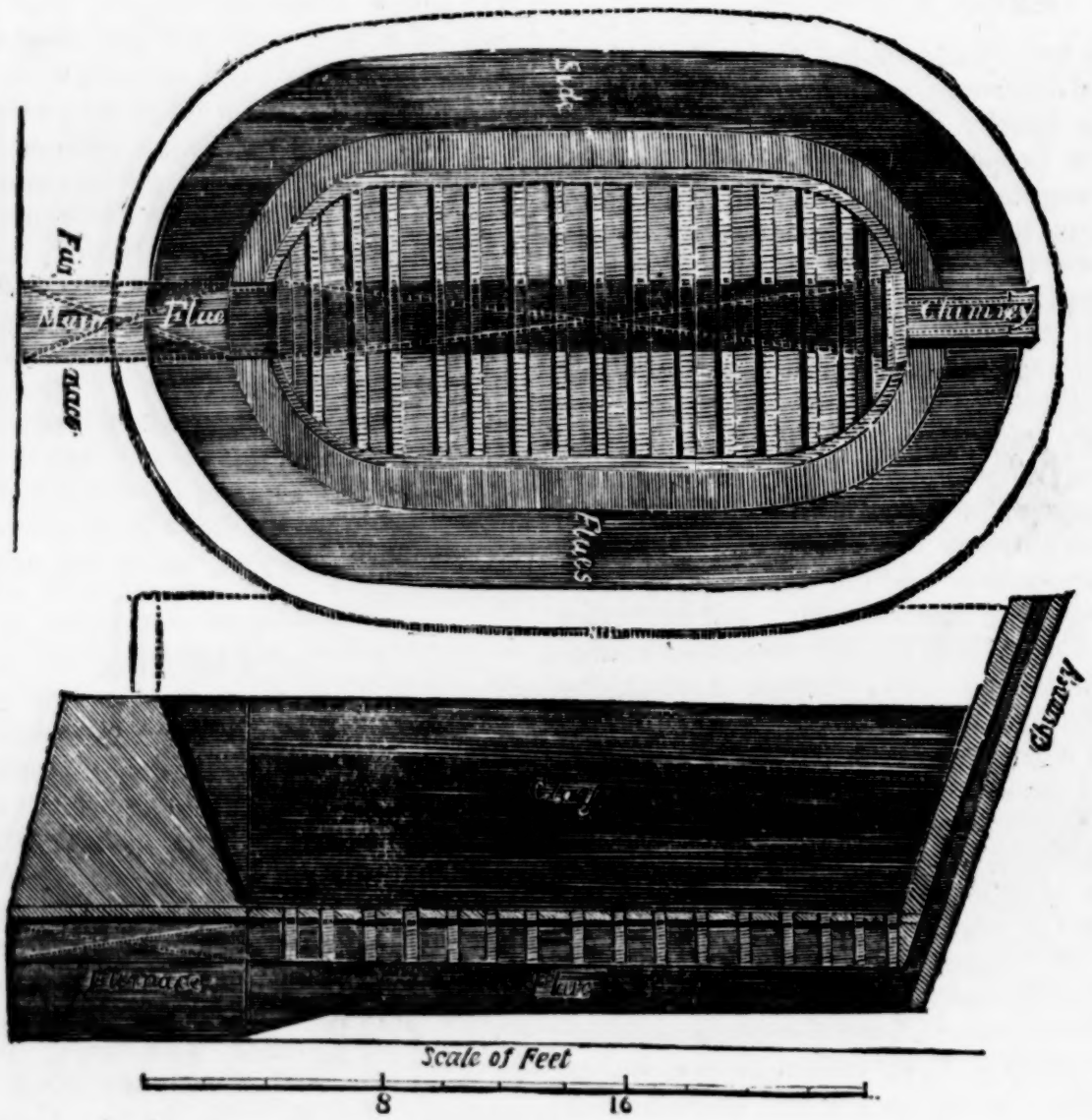
After the kiln is once lighted, it will burn several hundred bushels of earth without any additional fire inside; and the same kiln will answer for a length of time to renew the process when necessary.

The kiln used by General Beatson, which burns 250 cart-loads of 16 bushels each, was subsequently erected upon a more scientific principle; but as the form and construction cannot be fully comprehended without an engraving, we here insert the plan, elevation, and section. [See next page.]

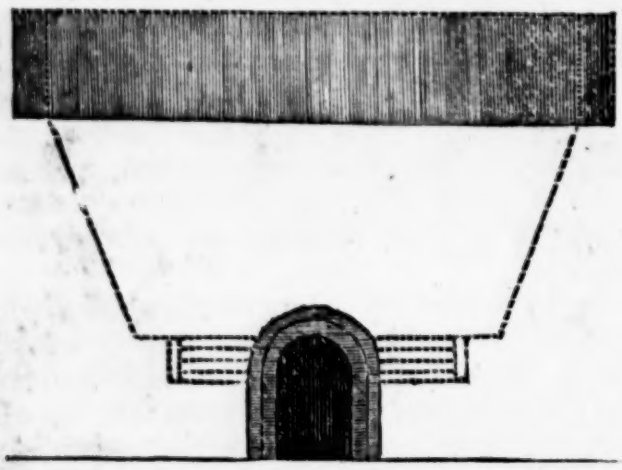
The iron floor, formed in the manner of a grid-iron, by transverse flues which convey the heated air immediately under the clay, has been found necessary in kilns of large dimensions, but in those of a smaller size thay may be dispensed with; and an arch, or main flue, passing from the furnace to the back of the kiln and having a chimney at the farther end, will answer the purpose.

The site of the kiln, which is dug out of the ground, should be as near as possible to the materials that are to be calcined. Steep, sloping banks, in which the furnace can be placed low, are evidently the best situations, because the lower the furnace the deeper may the excation of the body

* Part of a field of eight acres was manured with the ashes of stiff soil burnt in a kiln, and another part with ashes obtained by paring and burning, at the rate of 20 cartloads per acre. The whole field was drilled with wheat, and the crop was excellent; but no difference was perceptible at the time of growth, nor at that of reaping. New System, &c., second edition, p. 159.



of the kiln be sunk, and the more capacious it may be made. When the site is determined upon, the surface ground should be levelled, and the upper dimensions of the kiln accurately traced. The body is then excavated, the sides and ends gradually sloping in the manner represented in the dotted lines in this transverse section of the elevation of the breast of the kiln.



When the excavation has been completed to a depth sufficient for the furnace and flue, the trench for the latter, thus made from the breast to the back of the kiln, has a gradual declination from the back part, or chimney, for the purpose of letting off water; the inside is lined with bricks placed lengthwise. These two walls, four inches and a half thick, form the pier or support of the open arch, which is made with arch bricks, laid broad, also lengthwise; so that each arch is nine inches, leaving open intervals of four inches and a half. The open arch should have three ties, or a continuation of bricks, one along the key, or centre, and the other two along the sides, at half the distance between the key and the spring of the arch. These ties render the whole of the open arch firm, and not liable to be deranged by the heavy load of clay which is to be laid upon it.

A kiln of the dimensions here described is stated by General Beatson to require about 3000 bricks for its construction: mud mortar is used; and the expense of building the furnace, flues, &c., is only calculated at about 10*l.* or 12*l.* The size may be either increased or diminished, according to the measurement in the scale.

The clay is at first laid on carefully in large pieces, leaving wide interstices for the admission of heated air all along the arch of the main flue, and iron flues in the sides, when the kiln is large enough to require them. When the clay has covered these to the height of two or three feet, it may then be heaped upon the kiln, but the largest pieces should be always put in first, and the smaller reserved for the upper covering, in order to allow a free passage to the heat through the interstices of the latter. The clay should be rather in a moist state, because, if laid on when too dry, it is apt to be hardened by the heat; but if damp, or moist, the whole becomes, in a manner, steamed, and calcines into a light, porous substance, which easily pulverizes upon being exposed to the air.—A cart-load, or sixteen bushels, of moist clay, weighs about 1500 lbs., but when burnt, the weight is reduced to 1200 lbs. The kind of fuel must depend upon circumstances; but, in the midland counties, generally consists of wood, which may commonly be procured at about 4*s.* the cord for large roots in a rough state, or at the same price per 100 for faggots. Upon an accurate experiment, made in a small kiln, twenty-one feet by nine, having a furnace and an open arch flue, the result was, that with 275 faggots and half a cord

of roots, 80 cart-loads of clay were completely calcined at an expense of 13*s.* for the fuel, or less than 2*d.* per cart-load; and the whole cost, including labor, was only 10½*d.* per cart-load.

A more economical mode than the above has, however, been discovered, in the kiln used by Dr. Cartwright, and described as follows*:—

A trench was made—having a sufficient fall for taking off the water—about twenty feet long by three feet deep. At the upper end, and resting on its sides, a brick arch was turned, about nine or ten feet long, having openings for letting the fire through the clay, which were made by leaving out half a brick at proper intervals. In the front of the arch is a strong wall, two inches thick, which has its foundation in the bottom of the trench, and is two feet wider on each side than the arch, above which it rises about a foot; a mouth being left through it to the arch about two feet wide. The whole erection does not require more than 500 or 600 bricks; no lime, except for the front wall, is necessary, as the arch can be laid in loam or marl, mixed up to the consistency of stiff paste, and, if properly made, will last for many years. If, however, the saving of this expense be an object, the arch may be made of sods or spits of clay; but perfectly dry, or they will not support the weight. The centre may be formed by laying four or five strong stakes across the trench, and upon these faggots, in a circular form, to build the arch upon; when the work is finished, set fire to the centre of the faggots.

In setting the kiln, care should be taken, especially at the commencement, to lay the sods hollow, that the fire may draw through them freely. When the pile is about two feet thick upon the arch, the fire should be lighted, and a sod-wall made round the kiln, which may extend about two feet wider than the arch, and will be supported in front by the brick wall, but must not be more than three or four feet high. As the fire proceeds fresh clay must be added,—still letting it be as hollow as conveniently may be,—and when the heap is between four and five feet high, and burned through, the fire may be suffered to die out. But, if necessary, clay may be still added for a day longer at least.

Dr. Cartwright states that two men and a boy burned thirty-five good cart-loads, of twenty bushels each, in two days and a half, and the fuel consumed was 175 furze faggots, the expense of which he estimates thus:—

	s.	*d.*
Labor - - - - - -	14	9
Furze faggots - - - -	8	9
A donkey and cart (two days) -	3	0
Total - - - - - -	£1	6 6

This, which is equal to 9*d.* per cart-load, would only amount to 15*s.* for a top-dressing of twenty cart-loads, and may not be far from the mark; for although good faggots are seldom to be obtained so cheap, and the hire of a donkey and carts is somewhat too low, yet the men's wages are charged at 2*s.* 6*d.* a day each, which is higher than now customary.

*See the Repertory of Arts, Manufactures and Agriculture, No. ccxii. p. 78.

Kilns constructed of masonry, although the most permanent, have, however, been objected to; both because of the outlay in their erection, and the inconvenience often experienced in procuring workmen to build them. There is also this further disadvantage—that, although when once built there is an end of the expense, and with proper care they may be employed for years, yet, if placed at any considerable distance from the land to be manured, the cost of carriage will probably exceed that of burning. They are, therefore, usually formed in the very field on which the clay is to be laid, and out of which it is dug; in which case they may be made entirely with sods, or mud and straw, in the following manner:—

On a headland, or waste piece of ground, off which sods can be procured with sward sufficiently tough to build a wall, erect an oblong or a circular enclosure, about eight or ten feet in diameter*, and two feet thick, but not higher than three or four feet. On a level with the surface of the ground, cut flues, opening through the opposite sides of the wall, so that they may all meet in the centre of the kiln; make them also about five or six inches deep, and four wide, and let them be covered with sods on the top, so as to keep them free of clay and rubbish, and the mouths well open to the air. Then, in the centre of the kiln, place brushwood, turf, or any combustible, with some blocks of wood to strengthen the fire, and when all is well kindled, throw on some culm—if you have any—and then clay, and so on, adding clay to the heap as the fire may be found sufficiently strong to take the dressing; always observing to keep the heat of the kiln as even and as moderate as possible—just of sufficient strength to expel the moisture from the layers of clay as they are laid on. Much care should also be taken not to cover the fire too soon after being lighted, as that might extinguish it totally, and therefore the clods first put on should be of the largest description, that spaces may thus be left for the free admission of the heat. The smoke must be prevented from escaping; but the progress of the fire, as it ascends, may be ascertained by occasionally thrusting a finger here and there through the surface; to which, if it has approached very near, more matter must be added.

The walls, when made of sods, should be beat close with the spade, in order to prevent them from drawing air, by which the burning of the clay would be much retarded; the kiln may be then immediately lighted; but if made with mud and straw, they should be permitted to dry before the fire is kindled. They should not, at first, be built higher than three to four feet, nor the enclosure be wider than ten, because the earth can then be flung easily over every part; the fuel will also be thus more easily placed, and the firing more conveniently managed. As it is not necessary that much neatness should be observed in the construction, a kiln of this size may be erected, under proper directions, by five or six men in the course of a day. When the inside of the kiln however,

* Mr. Burroughs recommends walls eight feet square in the clear, and well joined at the angles by crossing the sods; but the contents of the circular kiln will probably burn more equally, and in other respects there is no material difference. See, also, Cobbett's Year's Residence in the United States of America, part ii. chap. iv.

begins to be filled up with clay, then the wall must be raised as high as may allow the earth to be thrown on without much additional labor; and care should be taken, during the burning, to keep the wall fifteen or eighteen inches higher than the top of the clay, in order to prevent the wind from acting on the surface of the fire. As soon as the fire is strongly kindled, the mouths of all the flues, except the one to windward, should be stopped, and even that will only be of use at the commencement of the process; for, if the fire burns with tolerable keenness, the sods of which the flues are composed will soon be reduced to ashes. Some people, therefore, dispense with the use of flues altogether; but the trouble of making them is very slight, and the want of them often occasions difficulty in the management of the fire.

The kiln may be increased to any size, by raising a new wall round the former when that one has been burned through; and in this manner kilns have been made so large as to contain more than 100 loads of ashes; but, as these walls cannot be equally pulverized, they should be broken down, and blended with the contents of the kiln, as that is burning out. No precise period can be fixed for the time which the operation will occupy, as much will necessarily depend upon the quantity of matter, the nature of the fuel, its management, and the state of the weather; most accounts, therefore, affirm, that it can be well accomplished —this is to say, both sufficiently burned, and afterwards cooled, in a few days; some, in a fortnight; others, in a month; but Mr. Burroughs says, that it requires about six weeks, and that it will not then be in good order for the land until after two months longer, for it will take considerable time to reduce it to powder. When the kilns are burnt out, the ashes are still paler than the original clay, and are generally in a powdery state, or are easily rendered so by a slight stroke of the shovel, either when filling the cart, or when they are spreading upon the ground: this, indeed, should never be neglected if there be any appearance of lumps, for if the earth be not completely pulverized, it will have little other effect upon the land than may be expected from bits of brick. The expense of burning clay in the kiln here described is stated to be, in Ireland, from 3*d.* to 4*d.* an Irish load, or about 40*s.* or 50*s.* the Irish acre,—equal to about 32*s.* imperial measure; but, with the usual inaccuracy observable in all accounts of manure *per load*, we are left to guess at its contents.

The chief art in burning is, *to keep out the air, and keep in the smoke;* which can only be accomplished by having the walls made quite close, and taking care to have the tops always lightly covered with clay. If the smoke should appear coming out in spots here and there, cover those places with sods immediately; for by thus half burning or charring the earth, it is supposed that any vegetable matter which it contains will be preserved, and that the staple of the land will not suffer. In short, the kilns must be carefully attended to, both day and night, until the operation is completed.—No rule can be laid down for the size of the clods, but those first laid on will burn more readily if dug up and dried a day or two before: if they be properly managed, that, however, is not absolutely necessary, and if once the kiln is fairly set a-going, no further fuel of any kind is required; for the clay, though wet, will continue to burn, unless extinguished by carelessness, as even the changes of the weather, except in very bad seasons, have very little effect upon it. It may, however, be proper to caution those who are not acquainted with the process, from opening any part of the kiln in order to ascertain its progress, for although, from its outward appearance, they may imagine the fire to be extinguished, it yet may be burning fiercely in the interior; and if the air be admitted, the main force of the fire will draw to that hole, where it will blaze out, and thus the work will certainly be retarded, if not entirely stopped. Although the process is very simple, when well understood, yet, like every thing else, it requires some experience, and mistakes are continually made by workmen who, not being already acquainted with the practice, are apt to burn the clay into lumps. It is, indeed, difficult to describe the operation with sufficient accuracy to enable those who have never seen it done to burn properly. Men who understand it can, however, be easily procured from districts in which it is common, and, with the instruction of one of these, any of the laborers on the farm can soon be rendered sufficiently expert; but, without such assistance, it would be inexpedient to attempt it.

Burning in heaps.

Another common mode of burning earth, is to dig up the surface of banks and headlands, or old borders, and, when dry, to cart it to a heap. The practice then is, to lay a foundation of earth, some inches thick, then haulm, straw, dry weeds, and a few bushes, whins, or anything of the kind, upon which the pile is raised in the form of a cone, and enclosed with a wall of turf in the manner already described. When fuel is scarce, an experienced burner will light a small heap and increase it to almost any extent, by pulling down part of the wall, drawing out a portion of the fire, and adding fresh earth. They are not uncommonly carried to twelve yards in diameter, and in that case generally contain about 100 loads of ashes, at 36 bushels to the load*. The digging and burning is stated to be done, in Suffolk, by contract, at from 6*d.* to 1*s.* per chaldron; but the carting, filling, and spreading will cost, on an average, 1*s.* per load; or, according to the following estimate, on 100 loads, as follows †:—

	£.	s.	d.
Labor in digging and burning -	3	15	0
Filling, 1*s.* 6*d.* per score, 7*s.* 6*d.*; and carting, with two carts and three horses, 16*s.* - - - - -	1	3	6
Filling and spreading, after burning, at 3*d.* per acre - - - -	0	15	0
Carting, and laying out over two acres	0	16	0
Total per 100 loads	£6	9	6

A nearly similar method is also much practised in Suffolk, where the earth is burnt in mounds, and it is called *clod-burning*. The clods are raked

* Essay on Cheap Manure, Anon., second edition, p. 47.

† Poppy, on Burning Clay, p. 6.

together in small heaps of from four to eight bushels, at a rod distance, and burnt by placing them upon a small quantity of haulm, or straw; but this should be done very expeditiously, on the fire being properly kindled; as otherwise it would be exhausted before a sufficient quantity was heated; for which reason it is proper to light them early in the day, that they may be well covered before sun set. This, however, differs from paring and burning, as it is not requisite that any weeds, or roots of weeds should exist in the soil, for the real earth alone burns or chars sufficiently; and as the smaller the heap, the less is the earth calcined, it is thought by some that the better is the manure. The idea is, however, probably erroneous; for these small heaps are so quickly burned, that what is on fire at noon may be completed before night; if despatch be an object, that may be attained by employing a greater number of hands, whereas large piles cannot be effectually prepared without more constant attention and delay; but, like the process of kiln-burning, this operation also requires some experience to carry on the work expeditiously, and to burn close. It is done by contract, and is stated, by Mr. Poppy, to cost, on tender soils, from 12*s.* to 14*s.* per acre, and to require half a load of haulm or straw. The expense, and the quantity of ashes produced by the clods, differ however, with the nature of the land. The more rough or tenacious the soil, the larger will be the clods: those from one to three inches over will produce from 25 to 35 chaldrons per acre; if larger, and abundant, perhaps double that quantity* ;and and land broken up after tares or seeds, will frequently produce 100 chaldrons, or even more if required, but from forty to fifty is generally considered ample. It should, however, be remarked, that a greater quantity may be collected, burnt, and spread, at a less average cost than a smaller.

Although the method of burning in heaps has the merit of simplicity, yet the plan is objectionable, because this method of managing the fire subjects it, in many instances, to be either extinguished, or to burn with such increased force as to convert any portion of the earth which consists of clay into mere brick; besides occupying increased time and labor, and occasioning an additional charge for cartage. It does not produce such good ashes as when the earth is calcined in a close kiln: neither has the same quantity of fuel equal power; for, by the erection of walls, the heat is effectually retained, and will continue for a long period after the fire has been extinguished; whereas, in these round heaps, the air having full power over every part of the surface, the internal heat is sooner checked, and the smothering process—which is considered essential to the value of the manure—cannot be so perfectly accomplished. Besides, as the walls are ultimately converted into ashes, their cost only amounts to the trifling additional charge of the labor of their erection.

Burning with lime

Is also a plan which has been adopted with much apparent advantage by Mr. Curwen, both when applied to the surface soil, and to clay taken from the under stratum. The method is as follows:—

'Mounds of seven yards in length by 3½ in breadth, are kindled with seventy-two bushels of lime; first, a layer of dry sods, or parings, on which a quantity of lime is spread, mixing sods with it—for he doubts whether clay can be properly converted into ashes without a mixture of surface soil, as it is in that case either calcined, or or not sufficiently burned. Then a covering of eight inches thick of sods, on which the other half of the lime is spread, and covered a foot thick; the height of the mound being about a yard.'

'In twenty-four hours it will take fire. The lime should be taken immediately from the kiln; but it is better to allow it to ignite itself, than to effect it by the operation of slaking by water.—When the fire is fairly kindled, fresh sods should be applied; and it is recommended to obtain a sufficient body of ashes from the sods before any clay is put upon the mounds. The fire naturally rises to the top; it takes less time, and does more work to draw down the ashes from the top, and not to suffer it to rise above six feet.'

Mr. Curwen also says, 'that the former practice of burning in kilns was more expensive, did much less work, and in many instances calcined the ashes, and rendered them of no value*.' On which it may be observed, that, with regard to the expense, the difference in labor in favor of the practice of burning with lime cannot be very material, for it only consists in the charge of raising the walls, with a little more attention to the fire, and will not amount to so much as the cost of the lime. As to the amount of work performed, he furnishes no data upon which an estimate can be founded; but, with respect to the management, there can be no little doubt that the operation with lime is the most simple. It may therefore be attended with considerable advantage in those districts where lime can be procured at a moderate price, as it must be supposed that the lime adds its full worth to the value of the ashes.'

Application.

The chief part to be observed in the *application of these ashes* is—that they be thoroughly pulverized, or at least brought into a state as nearly resembling powder as may be found practicable; and this cannot be effected unless the heat be so confined as to prevent it from spreading to a flame, for in that case the clay will be assuredly burned to bricks, and to this mistake many failures in experiments have been attributed. The term '*ashes*' may, indeed, in this sense, be deemed somewhat misapplied; but we know not any other that will more clearly convey our meaning, though our readers will doubtless comprehend that the process is to stop short of that state of hardness which is produced by the brick-kiln. In effecting this, care should be taken not to burn clay that has been much sun-dried, for if put on the kiln in that state, it will produce lumps which will not be easily broken; even by a mallet.

The *best time for beginning the operation* is

* Four-pronged forks are used to throw in large clods; the smaller ones are raked together. The rakes have handles eight feet long, the heads twenty-two inches, and twelve teeth four inches long, heavy and strong, having an iron collar at each end of the head, to keep it from splitting; the shovels should be broad, hollow, and light.

* Farmer's Magazine, vol. xvi. p. 411.

when the weather sets in fair, in spring; but the land should also be well cleaned, and brought into fine tilth, in order to allow of the soil being intimately blended with the ashes. When laid upon arable land, they should therefore be brought, as nearly as possible, into a state of powder, if intended for corn; but when applied to green crops, they may be used somewhat coarser.

Regarding the species of earth to be burned—strong clay is the best for the pupose, for its adhesive properties being destroyed by the process, it will become good manure for land of the same sort, and will be found advantageous to ground of almost any description; but when light soils are burned, (a practice, however, which we have shown to be in general disadvantageous,) the ashes are not calculated to apply to similar land, but should be laid upon strong clays or tenacious loam.

The *quantity of ashes to be applied to the land* may be varied according to its quality. Viewing its effect as chiefly mechanical, the more adhesive the soil, the greater will be the amount required: for as strong clays are apt to run together after heavy rains, and to retain the water upon the surface, instead of allowing it to penetrate to the pan below, the larger the quantity of matter which may have the effect of rendering them porous, the better; and its application to such ground hardly admits of any limit. In no case will it be found prejudicial, and, from what may be gathered from the foregoing experiments, as well as from the information of other practical men, we think that it should never be laid on any land in a less quantity than 800 bushels per acre.

For the Farmers' Register.

SALT MARSHES AND MALARIA. THE WHEAT CROP.

I reside on a salt water river, from which several coves make into my lands. At their heads are salt marshes, which are met by fresh water branches. I have for some time entertained the opinion, derived perhaps from the speculations in relation to the malaria from the Pontine marshes, that those grounds, in their present state, were the sources of our autumnal fevers. I have been greatly desirous to separate the salt from the fresh waters, so that they should only meet at the sluice.

Last year, I succeeded in shutting the tide out from one of my marshes, and kept it flooded during the winter with fresh water, to correct the salt with which it had been saturated. After treating it in the same way, next winter, I intend to sow it in herds grass on the sod, without resorting to the plough or harrow. Herds grass was strongly recommended as suitable for the wet marshy ravines of lower Virginia, by one of your correspondents in the first volume of the Farmers' Register, page 486. I have understood, that on some of the Delaware marshes, which had been found too wet and springy for other grasses, herds grass had not only taken well, but had given firmness and consistency to the soil. In a former volume of the Register, I had noted with much interest, the experiment of Mr. H. Carter, and greatly regret to see by a communication from him, in the number for May, that he has been obliged to abandon the experiment, which, in its early stages, promised permanent profit. It appears to me that the cultivation of Mr. Carter's reclaimed grounds in corn, for seven successive years, by exposing the soil to the sun and air, was calculated to produce the catastrophe he has experienced. I had thought if the low marshy grounds, of which I have spoken, were set in grass with strong tenacious roots, that though they might settle for a time, it would at length find its point of depression, and become firm and solid, and I must suppose that being set in grass, there would be no rotting and escape of the soil, as you, in your remarks, suggest. It is a matter of great interest to our country, that the low fenny grounds, now covered with flags and bent grass, the nurseries of musquitoes and malaria, should be reclaimed. My project is on a small scale and I should abandon it with regret, and on this matter I should be pleased to have the benefit of your experience and advice.

The present appearance, affords but small hopes of good crops of wheat. Most of our farmers sowed their wheat late, to avoid the fall fly; the autumn was cold, the winter unusually severe, and vegetation of any kind made no progress until April. With the exception of a light shower, we have sustained a drought of nearly a month. A most grateful and salutary rain is falling to-day, which promises to be abundant; and as I hear no complaints of the Hessian fly, if the weather be favorable until harvest I shall hope for half a crop in this county. Disheartening as our prospects are, they are not so appalling as the condition of the planters of the south-west. The demon of speculation did not cross the Chesapeake; though some few of our people, deluded by the romancers of the cotton country, removed their slaves to those golden regions, which I apprehend they will have good cause to rue.

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Queen Ann's Co. E. S. Md. May 15th, 1837.

REMARKS ON MARSH EFFLUVIA.

To the Editor of the Farmers' Register.

You desired in your editorial remarks on the subject of the deleterious effects of "malaria," some light on the subject of its *modus operandi* on the health of the neighborhoods in which mill-ponds are situated. I may not expect to enlighten your or the public mind on the subject; but conceiving it a matter of much importance, and having had occasion to pay a good deal of attention to the remote causes of fever, for the last ten years, I will essay a few remarks to you on the subject.

The effluvium arising from marshes, is a subtle, highly attenuated and undefined substance, the nature of which is unknown, and by no principles of analysis or synthesis have the medical part of the community been able to arrive at any satisfactory conclusion in relation to the thing itself. We know that certain causes produce certain effects under particular states of the atmosphere, and that the cause producing fever, is most generally owing to a principle known by the name of marsh effluvium, or miasma. Theory succeeding theory has been exploded, without arriving at any thing like certainty about the substance of miasm itself.

Dr. Good, one of the ablest modern writers on the subject, in reference to miasma, after comparing the theories of the best authorities on this

point, says, "the decomposition of dead matter, under the influence of certain agents, produces a miasma, that proves a common cause of fever." In speaking further of the remote causes of fever, he continues, "the whole of these agents have not yet been explored; but so far as we are acquainted with them, they seem to be the common auxiliaries of putrefaction, as warmth, moisture, air, rest, or stagnation." Dr. Good is of opinion that the character of fever may, and is probably owing to the quantity and particular combination of marsh effluvia, with some principle in the atmosphere, and the peculiar state of the individual's health. Dr. Cullen contends that marsh effluvium, will produce no other grade of fever, except intermittents, and that all other fevers are the result of contagion. Dr. Caldwell's opinion on this subject is, "we have long thought it probable, that the miasmaita which produce yellow fever, differ from those that give rise to intermittents, somewhat as the nitric does from the nitrous, and the sulphuric from the sulphurous acids. We know not on what other ground to attempt an explanation of the difference of their effects."

My own experience has led me irresistibly to the belief, that all varieties of fever may be produced from the same cause (marsh effluvia,) and that the particular grade is owing to the peculiar state of the health, the temperature of the atmosphere, and the quantity of miasm afloat in the air.

But to recur particularly to the case under consideration. I have been a practitioner of medicine in this neighborhood for the last eight or ten years, and live near a small creek, on which, when I first settled, there was no mill; but four years subsequently, a mill was erected, with a large pond. Previously to the erection of this mill, there had not been a case of fever occuring on the creek. The fall following there were three families sick; nearly all the members of each family had fever. The disease assumed both the character of intermittent and continued fever. Two of the families have removed, chiefly on account of their health. What is remarkable, the miller with a large family have all escaped, nor has there been any febrile disease below, or immediately opposite the pond; all the diseases occuring about or above the head of the pond. One of the families alluded to lives two or three miles above, and another near the creek, and some distance above. There have been many other cases of fever in the neighborhood alluded to, but I have only cited those particularly, which I think afford a striking example, in illustration of your position in relation to large ponds on small streams.

I account for the effect, solely on the grounds of the "sobbing," from the mill-pond, of the contiguous *clay*, and the decomposition of organized vegetable matter. I have seen many other cases in similar situations, which have generally been above the pond.

I remarked above, that miasm might arise from the effects of stagnant water on clay, under certain circumstances; and believe the position as susceptible of proof as any proposition in Euclid. I saw a family suffer severely from fever a few years past, when no other cause could have appeared to produce it, except that an unfinished cellar under the house had been about half filled with water, which had been allowed to remain for some time. Nearly every member of the family was made sick by it, and these constituting the only cases in the neighborhood. The accumulation of water had been the result of rain, the habitation having had no underpinning. The water had nothing to act on, in this case, except clay. Another instance in which a family took fever, I attributed to a puddle of water in the yard, occasioned by the soil being removed for mortar. In both of the above instances, liability to fever was removed by filling up the sinks with earth. Much more might be said in sustaining my position in reference to the exhalation of miasm, from clay lands under certain circumstances of heat and moisture, but I hope the above will suffice.

R. B. J****.

Halifax Co. Va. May 23rd, 1837.

For the Farmer's Register.

TRENCHING ON HILL-SIDES.

In looking over my last number of your Register, I find a piece written by Mr. Edmunds of Charlotte, entitled "Plan of a drained mill-pond on Wardsfork creek—Hill-side ditches, &c."

In regard to Mr. Edmunds' latter subject, trenching on hill-sides, much has been done and said in relation to it, and a great contrariety of opinion exists, in regard to the utility of trenching at all. I have, for the last eight or ten years, followed up the most approved plan of trenching, and am constrained to confess, that I believe more injury has resulted to my farm, than good, from the use of them, as heretofore constructed.

Finding the usual method would not do, I determined to use the trenches as rarely as possible, to give them as much fall as I might, and shorten them in length, whenever practicable, and make an embankment of clay, instead of soil. To obviate the deleterious effects of the water in shortening my trenches, I sow herds grass in the ravines, along which the water passes, to prevent rubbing from the water ejected from the furrows or trenches. We gain an additional advantage in a setting of grass, as proposed in a crop of hay, which is generally very good.

A very great objection to the establishment of the water trench has been, with me, the want of permanency in the embankment, attributable to the cutting through of moles. Whenever an embankment is perforated by a mole, (which is no uncommon thing,) it is immediately broken, and a gully is the necessary consequence. To prevent which, and to bring into requisition the soil which has always formed the banks of our trenches, I throw the soil below, plough the clay, and by hoeing out in the usual way, have the embankment of clay instead of soil, which embankment proves entirely impervious to the mole, and in fact to all such impressions from similar causes. The trouble of removing the soil is greater in theory than practice, for, after ploughing efficiently, it may be thrown below the trench with spades, or dragged with hoes, with much less labor than we would previously anticipate.

Mr. Edmunds goes on to say, in speaking of the trenches, "they are likewise frequently broken by collections of water in the intermediate spaces between the conductors. In these intermediate spaces, the water collects, and forms sluices, and runs into the ditches and fills them with sand, and

breaks over." I would obviate this difficulty in the construction of the trench. I make the above remarks, hoping the suggestions contained in them, may possibly lead some to practical improvement in the art of hill-side trenching.

R. B. J.

Halifax Co. Va. May 23rd, 1837.

AN ACT PRESCRIBING GENERAL REGULATIONS FOR THE INCORPORATION OF MANUFACTURING AND MINING COMPANIES.

[*Passed February 13th*, 1837.]

1. *Be it enacted by the General Assembly of Virginia*, That whensoever hereafter any joint stock company shall be incorporated for the purposes of manufacturing, or for the purposes of exploring and mining for gold, coal, copper, iron or other mineral substances, such company shall be established with the rights and privileges, and under the rules, regulations, and restrictions hereinafter provided.

2. Said company shall have power, under the name and style set forth in the act of incorporation, to sue and be sued, contract and be contracted with, to have and use a common seal, and change the same at pleasure; and may hold real estate, the number of acres, and the county or counties, corporation or corporations, in which said real estate is situate, to be specified in the said act of incorporation; and personal property for the purpose of conducting the business of manufacturing, exploring or mining, for which said company shall be incorporated; and shall have power to make such by-laws, rules and regulations, not contrary to the laws of the United States, or of this commonwealth, as may be deemed expedient and proper for the government of said corporation; but they shall not be authorized in any manner to divert the capital of said company from the specific purposes for which they are incorporated: *Provided*, nothing herein contained shall be so construed as to prevent any corporation from tilling any lands held by them, or from selling any timber, wood or other materials upon their lands.

3. The amount of the capital stock of such company shall be specified in said act of incorporation, fixing a minimum and maximum sum, to be raised by subscription, in shares to be specified; for which purpose, books of subscription may be opened by the corporators or commissioners named in said act, as the case may be, at such times and places as the said corporators or commissioners may designate, who, as soon as the minimum sum specified as the capital stock of said company shall have been subscribed for, shall call a meeting of the subscribers by advertisement, for two weeks, in some newspaper published in the neighborhood, or by some other convenient mode of notification.

4. And whensoever the mining or manufacturing operations of the company to be incorporated, are proposed to be located and carried on upon the lands or property of any person or persons who may be willing to sell the said lands or property, with the privileges and appurtenances necessary for said operations, to said company, or to convert the same into stock of the said company, and convey to them the said lands or property at a fair valuation, the said owner or owners shall, in the books of subscription, to be opened as aforesaid, fairly set forth and specify the quantity of land, with a precise description of the metes and bounds thereof, and a full statement of the other property, rights, privileges and appurtenances, which he or they propose to cede, sell or convey to, or to convert into stock of the said company, and the price affixed to and demanded by said owner or owners for said lands and other property; or if said owner or owners propose to sell a part to said company, and to subscribe the residue of said lands and property, he or they shall enter on the said books a full description of the part which he or they propose to sell, and the part which he or they propose to subscribe as stock of the said company, with the prices and terms of payment required therefor; and the said lands, property, &c., so subscribed by said owner or owners, shall be taken in full payment of his or their said subscriptions, and shall thereafter be, and constitute a part of the capital stock of said company, subject to be disposed of in like manner with the residue of their stock and property; and the lands, property, &c., which said owner or owners shall propose to sell to the said company, and which shall have been entered on the books of subscription, with the price and terms of payment affixed thereto, shall, if subscriptions be made in said books, and if the company shall thereupon proceed to organize itself, by calling a general meeting of the subscribers and electing a board of directors, as hereinafter to be provided, be considered and held as the property of said company, and the price of said lands, property, rights, privileges and appurtenances so entered in the books of subscription, shall be a lawful debt of the said company, and it shall be lawful for the said owner or owners to sue for and recover the same in any court having competent jurisdiction. And unless the said owner or owners of the said lands, property, privileges and appurtenances shall at the first meeting and organization of said company, or so soon thereafter as may be required of him or them, convey and assure to the said company a valid and perfect title in fee simple to the said lands, property, &c., according to the specification and description thereof, entered on the books as aforesaid, and also deliver possession of the same when demanded, the said company may, on such failure, either enforce a specific performance of the contract on the part of the said owner or owners, or at the election of the said company, may regard the subscription or sale of the said lands and property as forfeited and void.

5. For managing the affairs of such mining or manufacturing company, there shall be chosen at the first meeting of the stockholders, to be called as aforesaid, and on the first Monday of the month of May of every year thereafter, a convenient number of directors, not less than five, nor more than ten, who shall be stockholders of the said company; in which elections, and in all other meetings, the stockholders shall be entitled to one vote for every share owned by them respectively, up to the number of fifteen inclusive, and to one additional vote for every five shares from fifteen to one hundred, and to one additional vote for every twenty shares over and above one hundred, and may vote in person or by proxy, in such manner as may from time to time be prescribed in general meeting. The said directors, or a majority of them may choose from their own body a president, and in his absence, a president *pro tempore*. They shall have power to

call general meetings of the stockholders; to supply vacancies in their own body—to appoint such officers, agents and clerks as the stockholders in general meeting shall authorize—to take bonds with sufficient surety for the good conduct, fidelity and attention of such officers, agents and clerks—and to do all other acts and things touching the affairs of the company, not otherwise specially provided for.

6. The presence of stockholders entitled to a majority of the whole number of votes, in person or by proxy, shall be necessary to the transaction of business at any general meeting of the stockholders; and such meetings shall be organized by the appointment of a chairman and secretary; but a smaller number may adjourn from time to time. And if there should be no election of directors at any annual meeting, as herein before directed, the directors then in office shall continue until the next annual election by the stockholders in general meeting, in which the major part of the stock shall be represented.

7. If the whole amount of capital stock authorized to be raised by any act of incorporation shall not have been subscribed for before the company incorporated by said act shall have commenced its operations, it shall in such case be lawful for the president and directors of said company, whensoever they may deem it expedient, to cause books of subscription to be opened from time to time, until the whole amount of the capital stock authorized to be raised by said act shall have been subscribed for; and also, if so to them it shall seem proper, to fix the price of the additional stock at such a premium as they may from time to time direct—which premium shall be the common property of all the stockholders of said company, in proportion to the capital stock owned by them respectively.

8. So much of the price of each share subscribed, whether before or after the company shall have been organized, as shall remain unpaid at the time when the subscriber shall become a member of the company, shall be afterwards paid by the subscriber, his executors, administrators or assigns, in such instalments and at such times as the president and directors shall from time to time require; and if any subscriber, his executors, administrators or assigns, shall fail to make payment of any sum so required of him, after thirty days' notice of such requisition shall have been given in some newspaper published in the neighborhood, or by some other convenient mode of notification, it shall be lawful for the company to recover the same, or such part thereof as shall not have been paid, with lawful interest from the time when due, and costs, on ten days previous notice, in any county or corporation court, or in any superior court for any county or corporation within whose jurisdiction the defendant may be found; or, if he be not found within the commonwealth, then, upon motion in any superior court for any county or corporation in this commonwealth within which the cause of action may have originated, on three weeks previous notice in some newspaper published within said county or corporation, or contiguous thereto. And the company shall moreover have full power, in such manner as their by-laws may prescribe, to sell at public auction the stock of such delinquent to satisfy any judgment recovered against him, or to satisfy the amount, with interest, due from him and in arrear as aforesaid, though no judgment may have been recovered, and to transfer upon their books to the purchaser, his executors, administrators or assigns, the stock so sold; and if the nett proceeds of such sale, after defraying the costs and charges thereof, shall be more than sufficient to satisfy what is due from the delinquent, they shall pay over the balance to him or his order.

9. If any stockholder shall sell and transfer the stock held by him, before the payment of the full amount subscribed for, he shall be liable for the payment of the residuum of the amount due thereafter upon his subscription of stock, in case the person to whom said stockholder shall have sold and transferred his stock, shall fail to pay the same.

10. The stock, and all other property of such company as may be incorporated as aforesaid, shall be deemed personal estate, and as such shall pass to the executors, administrators or assigns of the stockholders. It shall be transferable only upon the books of the company, in such manner as the by-laws shall prescribe; and, until so transferred, the company shall be under no obligation to recognize the right of any assignee, and in the mean time may lawfully pay over the dividends to him who shall appear upon their books to be the stockholder, his executors or administrators, without being in any manner held liable to any other claimant. But real estate purchased by the company shall be conveyed to them, and, when sold by them, shall be conveyed to the purchaser by deed, as real estate, and as such shall be held liable to the payment of the debts of the company, and to sale under execution of *fieri facias*, in like manner as the lands of public debtors are sold.

11. Certificates of stock, signed by the president and countersigned by the secretary of the board of directors, and authenticated under the seal of the company, shall be delivered by the president and directors to each stockholder, in such manner and form as the stockholders in general meeting may direct.

12. The president and directors shall keep a regular journal of their proceedings, recorded in well bound books, and the proceedings of each day shall be verified by the signature of the president. The vote of each member, on every question decided by them when a division shall have been called for, shall be entered on the journal, if such entry shall be demanded by any member of the said board, which shall be laid before the stockholders at their general meetings.

13. The president and directors shall cause regular books of account to be kept, and balanced at least once in every year. And they shall cause dividends of the nett profits of the company, or so much thereof as they may deem it prudent to divide, to be declared and paid to the stockholders, at such time and in such manner as the by-laws may prescribe. And should any portion of the capital stock of the company be included in any dividend so declared and paid, the directors, by whom such dividend is declared, shall be liable, respectively, to all persons holding claims or demands against said company at the period of declaring such dividend; and moreover, each stockholder, who shall participate in the dividend of such capital stock, shall be liable to such creditors to the extent of the capital stock so received by him under such dividend. But such dividends of the capital stock may be made, when there shall

exist no claims or demands against said company, and such dividend shall have been ordered by the stockholders in general meeting, and after three months' previous notice in some newspaper in the neighborhood, or by some other convenient mode of notification.

14. Whenever four-fifths of the capital stock of such company shall become concentrated by purchase or otherwise in the hands of less than five persons, or more than one half of the same shall be and remain in the hands of one person for more than six months, all the corporate powers and privileges granted by the act incorporating such company shall cease and determine.

15. If the company should not be organized by the appointment of a president and directors within two years from the passage of the act of incorporation, then all its provisions shall be null and void. And if at any time the company shall suspend their operations for the space of two years, then their rights and privileges shall cease, and their charter shall be forfeited. But whensoever the said corporation shall be dissolved, whether by lapse of time or any other cause, their corporate name, with their right to sue and be sued, shall continue for the purpose of collecting the debts due to the company, prosecuting the rights which shall have accrued under their previous contracts, paying the debts due by them, and satisfying all liabilities which they may have incurred, and for the distribution of the property of the corporation among those entitled to the same.

16. That all acts for the incorporation of manufacturing or mining companies passed after the passage of this act shall continue in force for the period of thirty years and no longer, and shall at all times after the lapse of fifteen years from the organization of the company be liable to be amended or repealed at the pleasure of the legislature, in the same manner as if an express provision to that effect were therein contained, unless there shall have been inserted in such act of incorporation an express provision to the contrary.

17. *Be it further enacted*, That the president and directors of said company shall exhibit its books and property, condition, &c., to the inspection of such agent or agents as the General Assembly may from time to time for that purpose appoint.

18. *Be it further enacted*, That no company claiming the benefit of this act, shall by deed of trust, mortgage or otherwise, incumber their property for the purpose of giving the preference to one creditor over another; and that whenever any such deed or mortgage shall be given to any one or more creditors, it shall enure to the benefit of all the creditors of such company existing at the time of such conveyance, and all such creditors shall be entitled to rateable satisfaction out of the property embraced by such conveyance.

19. This act shall commence and be in force from and after the passage thereof.

GERMAN RAILROADS.

It is a remarkable fact, that in the formation of the railway between Prague and Pilsen, the individuals employed were chiefly females, each of whose wages amounted to 6*d*. a day. There were upwards of 2000 regularly engaged as laborers, in forming the embankments, excavating the soil, &c. During the two first years the engineer was able, in the course of 40 English miles, to cut no less than 696,465 cubic yards, and to construct 907,844 cubic yards of embankment, besides laying the way with malleable rails. He erected during these two years 73 bridges from three to eighteen yards each, with 133 culverts; and he also made 236 wagons. And all this at an expense of about £75,200.

From the London Magazine for 1746.

OBSERVATIONS IN SEVERAL VOYAGES AND TRAVELS IN AMERICA.

[Continued from page 327.]

Maryland and Virginia.

And now let me address me to my journey, which lay in a very pleasant road, through the woods, that every now and then presented you with an opening plantation. We met an Indian man and woman upon this road, who came from a town of wigwams, near Snow-Hill, where they inhabit, in great peace, with their neighbors. We passed several branches * and savannahs, and the road all the way is pretty much upon the level, and marshy; the soil of the upper grounds a loose reddish sand or earth. At our arrival at Snow-Hill, I took up quarters at an ordinary, † and found them very good. The parson of the parish, who has the only brick house in town, was a good conversible man, as was also the presbyterian minister, a Scotchman, of which nation great numbers are settled hereabouts. The church and all the houses are built of wood, but some of them have brick stacks of chimneys: some have their foundations in the ground, others are built on puncheons or logs, a foot or two from the earth, which is more airy, and a defence against the vermin. The women here are very pretty, and the men, for the generality obliging enough. The town is very irregular, and has much the aspect of a country fair, the generality of the houses differing very little from booths. We staid here only one day, and the next set forward with hired horses, not being able to buy any in the town. The hire was a shilling sterling per day for each horse, and a shilling per day for a guide. They are good serviceable little creatures, ‡ and travel at a great rate. The next night we got to the line that divides Maryland from Virginia, being about thirty miles, through a road whose delightful scenes constantly refreshed the senses with new and beauteous objects. And here I cannot help quoting Mr. Lewis, when speaking of another road in this colony, he says;

> But now the enclosed plantation I forsake,
> And onwards through the woods my journey take;
> The level road the longsome way beguiles,
> A blooming wilderness around me smiles;
> Here hardy oak, there fragrant hickory grows,

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* A branch is a stream running across the road, from some neighboring creek or river.

† Or tavern, eating house, or inn.

‡ And live most prodigiously hard. At night, you need only tether them out, and they pick subsistence enough in their station. I have known them go six days journey without a feed of corn; having nothing but the stalks of Indian wheat, and such other litter as they could pick up.

Here stately pines unite their whispering heads,
And with a solemn gloom embrown the shades.
See there a green savannah opens wide,
Thro' which smooth streams in wanton mazes glide;
Thick branching shrubs overhang the silver streams,
Which scarcely deign to admit the solar beams.

And, indeed, I cannot help, every now and then, taking him out of my pocket in this country; for his descriptive part is just and fine, and such a warmth of sentiment, such a delicate vein of poetry, such an unaffected piety runs through the whole, that I esteem it one of the best pieces extant. This, with my other dearer treasure, and my *Euclid*, generally relieve me from a too great sameness of prospect, or frequency of the same objects.

Here, having brought several bottles of wine for the purpose, we drank success to Britain, his majesty's health, and that of the right honorable proprietor, whose great and good qualities have endeared him much to the people of this colony.

There certainly cannot be a greater grievance to a traveller from one colony to another, than the different values which their paper money bears; for if he is not studious to get rid of the money of one place before he arrives at another, he is sure to be a considerable loser. The New England money, for instance, which is excessively bad, and where, to pay a six-pence or three-pence, they tear a shilling bill to pieces, is much beneath the New York money in value, and will hardly be got off there without some person is going into the first named province. New York and Pennsylvania often differ about the dignity of their bills, and they fall and rise in the different circulations they take. The Maryland money is generally pretty good, but of a low value, and this, again, is not taken on the western shore of the Chesapeake, where only gold and silver is current. North Carolina is still lower than Maryland, and South Carolina worst of all; for their money there is so low as seven for one sterling, so that it makes a prodigious sound; and not only so, but even private traders there coin money, if I may use the expression, and give out small printed or written circulating notes, from six-pence to a pound, and upwards; in which they are, no doubt, considerable gainers, not only by the currency of so much ready money, without much expense in making it, but also by loss, wearing out, or other accidents. In Georgia, again, this money never passes, for all their bills are of sterling value, and will pass all over America as well as bank notes. There are, I find, some considerable gains and stockjobbing in America, by the issuing out, and calling in, their new and old bills, which I shall not think proper to touch upon.

There are very considerable numbers of Roman catholics in Maryland, particularly about the borders of Pennsylvania; but the bulk of the colony is of the episcopal persuasion, with a grand mixture of divers other sects. The women are very handsome in general, and most notable housewives; every thing wears the marks of cleanliness and industry in their houses; and their behavior to their husbands and families is very edifying. You cannot help observing, however, an air of reserve, and somewhat that looks at first, to a stranger, like unsociableness, which is barely the effect of living at a great distance from frequent society, and their thorough attention to the duties of their stations. Their amusements are quite innocent, and within the circle of a plantation or too, they exercise all the virtues that can raise one's opinion of the too light sex. I would premise here, that I am not writing any thing yet of the more refined part of the colony, but what I say now is confined to a tract of about two hundred miles; for in some other parts you will find many coquettes and prudes, as well as in other places; nor, perhaps, may the lap-dog or monkey be forgotten. Hail delightful sex! would you divest yourselves of but some few foibles; would you attend somewhat more to the knowledge of yourselves, and turn your eyes inwards; had not the rolling chariot, the shining ring, the Indian exotics, the Frenchified affectation, the gay coxcomb, more charms than knowledge, decency, prudence, discretion and merit, how happy would you be! But to roll on in a continued round of senseless impertinence, will never, never, raise you to the character or situation of these American wives. My God! what a different view has the representation! the one a piece where every figure on the canvass glows with native ease, grace and proportion; no artful heightnings, no absurd conceit, has debased the great designer, nature. On the contrary, turn your eyes this way; what figures are these? From what distant clime were they imported? From the region of sickly whim, and the designer sure, like Rabelais, was resolved to paint some beings that were too odd to exist any where else. What a load of ornaments, and a glare of colors, that quite hurt the eye in looking on the piece! nor is there one truly smiling stroke, one grace, nor one beauty in the whole delineation.

What's female beauty, but an air divine,
Through which the soul's unfading lustres shine?
She, like a sun, irradiates all between;
The body charms, because the mind is seen.
INCERT. AUCT.

I should busy myself more in the descriptive part of my journal whilst in this colony, did I not reserve myself, till my arrival in Virginia; for there is such a connection between the trade and nature of the soil, and the commodities they raise and export, that one general account will serve for both. Nor do the two countries appear much of a different form; for in the uplands of Maryland, they are as mountainous, and abound in valleys as much as they do in Virginia. For this reason, I waive those matters till I arrive there, and insist so much on the manners and tempers of the inhabitants and the genius of this country.

They have some considerable seminaries of learning in the two colonies; but Williamsburg College in Virginia is the resort of all the children, whose parents can afford it; and there they live in an academical manner; and, really, the masters were men of great knowledge and discretion at this time; though it cannot vie with those excellent universities, for I must call them so, of the Massachusetts; for the youth of these more indulgent settlements, partake pretty much of the *petit maitre* kind, and are pampered much more in softness and ease than their neighbors more northward. Those that cannot afford to send their children to the better schools, send them to the country school-masters, who are generally servants, who, after serving their terms out, set up for themselves, and pick up a livelihood by that, and writing letters, and keeping books for their

illiterate neighbors. Often a clever servant, or convict, that can write and read tolerably, and is of no handicraft business, is indented to some planter, who has a number of children, as a schoolmaster, and then, to be sure, he is a tip-top man in his parts, and the servant is used more indulgently than the generality of them.

As I said before, the young fellows are not much burdened with study, nor are their manners vastly polite. But the old gentlemen are generally a most agreeable set of companions, and possess a pretty deal of improving knowledge; nay, I know some of the better sort, whose share of learning and reading, would really surprise you, considering their educations; but this, to be sure, must be an after improvement. One thing they are very faulty in, with regard to their children, which is, that when young, they suffer them too much to prowl amongst the young negroes, which insensibly causes them to imbibe their manners and broken speech. The girls, under such good mothers, generally have twice the sense and discretion of the boys; their dress is neat and clean, and not much bordering upon the ridiculous humor of their mother country, where the daughters seem dressed up for a market.

It is an odd sight, that except some of the very elevated sort, few persons wear perukes, * so that you would imagine they were all sick, or going to bed. Common people wear woollen and yarn caps; but the better ones wear white Holland, or cotton. Thus they travel fifty miles from home. It may be cooler, for ought I know; but, methinks, it is very ridiculous.

They are all great horsemen, and have so much value for the saddle, that rather than walk to church five miles, they will go eight to catch their horses, and ride there; so that you would think their churches looked like the out-skirts of a country horse fair; but then, as some excuse, it may be said, that their churches are often very distant from their habitations.

An universal mirth and glee reigns in Maryland, amongst all ranks of people, and at set times, nothing but jollity and feasting goes forward. Music and dancing are the everlasting delights of the lads and lasses, and some very odd customs they have at these merry-makings. You would think all care was then thrown aside, and that every misfortune was buried in oblivion. In short, my spirits have been sometimes raised so much, that I have almost forgotten I was of another clime, and have wished myself for ever amongst them. Adieu! happy people! For the favors I have reaped at your hands, gratitude shall ever fill my breast. I leave you but to return again; † once more to partake of your halcyon feasts, and hearty jovial mirth.

For now, with gladdened eyes, we view the bounds
Of that famed colony, from whence the weed,
The salutiferous plant, that fends the breast
From noxious vapors of the inclement morn,
Provocative to solid, studious thought,
Derives its birth and use; the land that erst
Employed the labors of our virgin queen,
And still is sacred to Eliza's fame.

* Wigs—then generally worn in England.—Ed. Far. Reg.

† The author was again in Maryland for some time, and many of the detached observations were made then, though he chose to interweave them with this short tour.

In leaving these lowlands of Maryland, and passing into Virginia, you find the scene greatly altered; and hills and dales, with more frequent plantations, seem, entirely, to take off the rudeness of the country's aspect. The roads, also, through the two counties of Acomoco and Northampton, save here and there, are equal to most in England; though not near so commodious, as in the counties on the other side of the bay. You pass over several considerable rivers, and branches, and find many lofty and commodious bridges; whilst the same hospitality, simplicity and honesty reign amongst the inhabitants, as in the part of Maryland I have just traced. Indeed, you find greater, and more considerable marks of opulency; and we begin to regale with excellent wines, good brandies and rum, and, here and there, with English porter, which is imported generally in bottles. Trade, also, seems to flow in a brisker channel, and the stores of the merchants to be better provided; nor are the gentlemen a little vain, of their being a part of the king's government, and look down with an air of contempt, upon the neighboring patentee colonies.

The inhabitants on the Western Shore, are supplied with prodigious quantities of beef, pork, and grain from this Eastern Shore, as they call them, by way of distinction; to whom they give, also, ironically, the epithet of Buckskins, alluding to their leather breeches, and the jackets of some of the common people; which is, all over Virginia, as great a reproach, as in England, to call a man oaf, or clown, or lubberkin. This Eastern Shore, is a neck of land, resembling a peninsula, having its junction, in about 40° north, with the main land, somewhat above Annapolis, near Baltimore and Elsingburg, upon the frontiers of Pennsylvania, where the Delaware bay and river, form to the east, and the heads of Chesapeake bay, to the westward, a kind of isthmus; and thence, trending away south-easterly, terminates at Cape Charles, nearly in latitude 37°, and is one of the arms, that confines the noblest bay in the universe; though, with all winds it is not so convenient to ride in, as having a dangerous plenty of sands, shoals, and reefs, that have proved very often full of distress. In this bay, the whole navies of Great Britain, Holland and France, might ride at anchor; it being, from Magidi bay, to the entrance of York river, more than twenty miles over; and into which, a number of the noblest navigable rivers disembogue themselves, which you may, as far as eyes can reach, see overspread with waving forests of European vessels, and a lesser tribe, who trade from shore to shore, and exchange their own products for those of their neighbors. The common harbor for the men of war, in this station, is Sarah's creek, on the Glocester side of York river; which a late commander, the thrice renowned Sir Yel, peace be to his ashes—rendered as shamefully famous, as ever Turtle bay was rendered by P——— or E———s; or Hobcaw, by some others. But to return; we made two stages, from Acomoco Court-house; lying at Pongoteag the first night, and at the ferry house at Magidi bay (where a chaloupe attends to transport passengers and their horses to York, Norfolk, Gloucester, James-Town, or other parts, at a *pistole* a horse and man) the second day, being two days and an half from the line, the distance being more than one hundred miles from Snow-Hill in Maryland. There are

no considerable towns on this shore, only a few scattered hamlets, particularly, at the court-houses of the two counties, which renders them far less polite, than the inhabitants on the other side of the bay, where large towns abound, and, which are the rendezvous of the several tobacco fleets that sail from Europe; but to make amends, it may, with regard to their honesty, and kindness to one another, and to strangers, be justly called, the Elysian Fields of Virginia. I shall have, again, occasion to mention this part of the colony, I find, when I begin to enter into the nature of the tobacco trade.

No sooner the morning dawned, than we roused from our beds, and addressed ourselves to our voyage, in one of those delicious mornings, in which nature seems to take pride, in displaying her whole profusion of charms; and when a wretch must be quite inanimate, not to rejoice with the whole creation, at the infinite kindness and benevolence of Providence. All hail! eternal sovereign of the universe! Low, on this sandy beach, surrounded with these venerable shades, and whilst the waves are laving at my feet, let me adore the great, the awful dispositions of thy creating wisdom! Alas! how my importance droops, and how inconsiderable I appear; when, but now, I imagined myself one of the lords of this globe, and rashly suggested to myself, that all these mighty stores of blessings were intended to solace and delight mankind alone! But if so, why are the most remote regions so bespangled with thy goodness; regions but lately known, and yet, scarce one ten thousandth part peopled? My mind opens ——; surely, thy wise intention was to excite the benevolence of thy more happy creatures, and to make thy saving health known to all nations, by spreading the knowledge of true religion and virtue, even amongst the sable inhabitants of these lovely deserts.

After being victualled for our voyage, which generally employs three or four hours, and we had gotten our baggage and part of our attendants on board, we ourselves stepped into a small *punt*, * and put off to the shallop; which, by reason of the shallowness of the water, lay at anchor near a mile from shore, and beyond a very ugly reef, on which the waves broke with great fury; attended by scores of porpoises, who were wantoning about us. We had very nearly gained the vessel, when two of these stupid hogs came souse against one side of the *punt*, and overturned us, just upon the back of the shoal.

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In two or three days we embarked, being perfectly recovered, and addressed ourselves once more to the passage; and here, how can I help sketching out the various beauties and adornments of nature, that elucidated our pleasing voyage? Suppose us now near ten miles from either shore, about the meridian of one of the most transporting days, that could have occurred for us, whilst

——— every storm,
Is hushed within its cavern, and a breeze
Soft-breathing, lightly with its wings, along
The slackened cordage glides; the sailors ear
Perceives no sound, throughout the vast expanse,
None but the murmurs of the sliding prow,
Which gently parts the smooth and azure main.
GLOVER.

The golden rays of the sun darting through the gloom of the surrounding woods, and reflected upon the translucent face of the watery plain, gave so lively a perspective draught of the circumjacent country, that we were at a loss whether to fix our admiring view upon the reality, or the representation. These woods, every where diversified with interspersed plantations, by their reverend gloom, seemed the retreat of some ancient druids; nor could I forbear a kind of reverence for so awful a scene, really much calculated for a seat of superstitious rites and ceremonies; where not a sigh of the softest zephyr, but in a mournful, melancholy whisper, is heard through the whole forest, and seems even to form articulate sounds. Whilst now and then the long pausing scream of the turkey, or the quick, smart cry of the paroquet, interrupts the responsive lays of the turtle, and the rest of the musical choir, and passes in thrilling chorus from grove to grove, from brake to break; whilst imitative echo fondly retains the sound. Who can, here, help recalling to his mind, the fauns and satyrs of the ancients; their fables of Diana and her virgin train, and their whole beautiful decoration of the sylvan scene? When these fables were first sung, even the now despoiled and desert regions of Achaia, and the territories of Italy, Gaul and Britain, bore just such an aspect; so buried in the depth of almost impassable woods, and the inhabitants of some of them little more civilized than the Indian natives of these regions. And no doubt, but in proportion to the increase of our colonies, the manners of the ancient possessors may be polished, and their brutal fierceness tamed; seeing so many potent nations are exhausted, already, by their intestine wars, or broils with the Europeans, that they are in the whole America not of half so much importance as they were one hundred years ago. Nay, many nations live amongst the English, there being several settlements of them in New England, Maryland, Georgia, &c. and in the first named place, whole tribes who have embraced the Christian religion, and have teachers of their own set apart to the ministry. Like our preoccupiers, the ancient Britons, the Indians perform all religious ceremonies and mysteries in the deepest retreat of the woods; and inured from their infancy to heroic idleness, and hunting for subsistence, they esteem the open savannah or the corn-field, no farther than for profit, whilst their choice hours of pleasure are generally sought in the shade. I remember to have asked the famous Toanahowi, so caressed in England some years ago, by the royal family, how he liked that country? He told me, they were good people, but that it was a poor country, and he could not live in it, because they had no woods nor deer, but what were kept in some gardens; for so he styled the parks of England. * But to return: the infinity of sloops and

* A very small and dangerous sort of canoe, liable to be overturned by the least motion of the sitters in it. The negroes manage them very dexterously, with a paddle.

* This Indian was killed at the head of his people, valiently fighting, as an auxiliary party to the English, by the Yamasees, in the year 1743, and was interred with military honors at Fort William. He was a son

barks that appeared every where around, the fine vistas, up York and James rivers, and other navigable streams, the prodigious flights of wild fowl, that darkened the air, all in their native strains hymning the great creator; the alhicores, dolphins and porpoises wantoning on every side, and a long, long view of the wide ocean, with a whole fleet of vessels in the offing, tumbling in the calm, and reeling their lofty, unsteady heads; the lowing of the goodly kine, the bleating of the sheep, the neighing of the useful steed, and the cries of the laborious husbandman, plunged us into an admiring ecstacy. Nor could we forbear to exclaim, "How manifold are thy works, O Lord! In wisdom hast thou made them all! The earth is full of thy riches. So is this great and wide sea, wherein are things creeping innumerable. both small and great beasts. There go the ships," &c. A delicious moonlight night succeeded this brilliant day, and exhibited still new and more delectable scenes of wonder, and millions of unknown regions, the work of an eternal, unbounded creation. Lost in the contemplation of these blessings—struck with such a field of magnificence—exclamation and rapture is succeeded by the lowest adoration, and the most unfeigned praises!

Where'er we stir, where'er we look or move,
All, all is him, and every where is Jove.

LUCAN.

At eight the succeeding morning, we discovered the red clifts of York-Town, and the opposite town of Gloucester; and sure, nothing could form a more romantic sight. The place being somewhat situated like Dover, and the town standing on a descent, you can only perceive three or four houses at first view, and scarce any thing presents itself but these steep, sandy banks, dug into an infinite number of holes and caverns, and the battery of guns before the town upon the pitch of the bluff.

York-Town, capital of the county of that name, is situated on a rising ground, gently descending every way into a valley, and though but straggligly built, yet makes no inconsiderable figure. You perceive a great air of opulence amongst the inhabitants, who have some of them built themselves houses equal in magnificence to many of our superb ones at St. James'; as those of Mr. Lightfoot, Nelson, &c. Almost every considerable man keeps an equipage, though they have no concern about the different colors of their coach horses, driving frequently black, white, and chesnut, in the same harness. The taverns are many here, and much frequented, and an unbounded licentiousness seems to taint the morals of the young gentlemen of this place. The Court-house is the only considerable public building, and is no unhandsome structure. The amiable hospitality I have just passed an eulogium upon, on the other side the bay, seems on this shore to have found no great footing. Schemes of gain, or parties of gaming and pleasure, muddy too much their souls, and banish from amongst them the glorious propensity to doing good. The most considerable houses are of brick; some handsome ones of wood, all built in the modern taste; and the lesser sort, of plaster. There are some very pretty garden spots in the town; and the avenues leading to Williamsburg, Norfolk, &c. are prodigiously agreeable. The roads are, as I said before, some of the best I ever saw, and infinitely superior to most in England. The country surrounding is thickly overspread with plantations, and the planters live in a manner equal to men of the best fortune; some of them being possessed of 500 or £1000 a year, sterling.

Gloucester, Hampton, and Norfolk, are towns of near the same structure, there being little difference, save that at the last mentioned place, a spirit of trade reigns, far surpassing that of any other part of Virginia. A great number of vessels are fitted out from thence, to trade to the northward and the West Indies; and the inhabitants are, from their great intercourse with strangers, abundantly more refined. But before I leave York entirely, I should just mention the battery, that is the defence of the town, which at this time was under the direction of an awkward engineer, by trade a barber, and is as despicably contrived for the safety of the place, as it, no doubt, would be conducted in a time of danger. Indeed, Virginia is quite an open country to the incursions of an enemy, having little to resist an attack by sea, but the men of war stationed there, which are generally two or three. In a land expedition from the natives, or French and Spaniards, indeed, their numbers, it is hoped, will always protect them, seeing that they could assemble at the shortest warning, a militia of eighteen or twenty thousand men. They have also some forts towards the Apalaches, which bridle the Indians, and secure the trade with them.

Williamsburg is a most wretched contrived affair for the capital of a country, being near three miles from the sea, in a bad situation. There is nothing considerable in it, but the college, the governor's house, and one or two more, which are no bad piles; and the prodigious number of coaches that crowd the deep, sandy streets of this little city. It is very surprising to me, that this should be preferred to James-Town, Hampton, or some other situations I could mention. Here the courts of justice are held, and with a dignity and decorum, that would become them even in Europe. The present Lieutenant Governor Gooch is much beloved by every one, and by his mild and agreeable disposition, diffuses content every where around. The posts that are most stickled for here, are the office of secretary, which is said to be worth £900 per annum; and the being naval officers to the several counties, which are the places of good profit.

* * * * * *

to the great Mico Tomo Chachi. and always bore an extreme regard to the English. He had, however, this satisfaction, to see most of the Yamasees cut off before he expired.

From the Alton [Illinois] Observer.

REMARKS ON THE MANUFACTURE OF BEET SUGAR IN FRANCE, AND THE INTRODUCTION INTO THE UNITED STATES.

The following very interesting letter on this subject has been handed us for publication, by the gentleman to whom it was addressed. Mr. Chi went to Europe under the auspices of a compan consisting of Messrs. B. Godfrey, W. S. Gilman Dr. B. F. Edwards, George Kimball, and oth citizens of this state. The object of the compan as we understand, is to introduce, if practicabl the culture of the sugar beet, and its manufactur into Illinois. Mr. C. is himself connected wi the company, and has gone to France for t

purpose of acquiring such information as will be necessary and useful for their future oporations. His letter will doubtless attract the attention of all our readers.

P. S.—Since the above was written, we have been informed that the company above referred to has been incorporated, for the purpose of manufacturing sugar from the beet, oil from the poppy, and the culture of silk. The capital of the company is $200,000, with the privilege of the holding real estate to a certain extent. We trust they will, in western phrase, "go ahead."

Arras, Jan. 9, 1837.

Dear Friends: I have now been one month an observer or laborer in a sugar manufactory, and have made short visits to several others.—The beet sugar business, taken in all its branches and bearings, is interesting beyond my expectations: but to the mere manufacturer, I doubt whether it is as profitable as Pedder's report would lead one to suppose.

In the first place, the beets do not yield, on an average, more than *five* per cent. of sugar. They may yield more when first dug and before they have begun to *sprout*, but I am satisfied that *six* per cent. is the utmost that can be calculated upon, under the most favorable circumstances. The beets, after being gathered together in heaps, and covered with earth to preverve them from frost, soon begin to sprout. By the middle of December this season, which had been warmer than usual, they had put forth considerable. Various expedients have been employed to prevent this heat, which is generated in the heaps, and gives rise to this, but none of them have as yet completely succeeded. This shows the importance of an early sowing, and an early commencement of working up the crop. Here the seed is sown in the first days of May. In Illinois I should suppose it might be sown as early. The working up of the crop ought to commence before it has attained its utmost growth, say in the last days of August or the first of September at farthest.—There will then be seven months for the manufacture, and in most of those months laborers have little employment, and may be hired for comparatively small wages.

The quality of the sugar earliest made is the best, as well as the yield the greatest. In fact, a small quantity of the first product of the season is all the beet sugar I have met with that appeared to be fit to use *without refining*. In France very little except refined sugar is used, or had been for a long time before beet sugar was introduced. The meanest *cantines* (liquor shops) and the poorest families use, constantly and exclusively, refined sugar. To this circumstance I attribute the fact, that a certain bitter taste, generally belonging to the brown sugar of beets, has not been much mentioned here, and not known at all in the United States. It would probably be thought of great importance there. People are not agreed about it here. Some maintain that the brown sugar may be made at all times of such quality as to admit of universal use, and that in point of fact it is used to a considerable extent already. Others have told me that neither the brown nor refined sugar of the beet is equal to that of the cane. I feel able myself to contradict the latter assertion. I have used the beet sugar constantly since I arrived in France, and I can perceive no difference in flavor, or quantity of saccharine, between it and the sugar of cane. If there be any difference, it consists in a certain brilliant whiteness, which beet sugar seems to me to possess in a degree superior to most of the colonial sugar. I have good authority for saying that the French custom-house, though many tests have been applied, find it impossible to distingush satisfactorily between the two. The reason why they seek to do so is, that a drawback is payable on the exportation of refined sugar of *the colonies*. The refiners offer beet sugar for the drawback, and obtain it, notwithstanding great vigilance is exercised upon the subject.

You see, therefore, that the sugar in a refined state presents no such difficulty as it does when raw. I have mentioned that difficulty, not because it weighs much in the mind, but because I think it probable that in the United States, where the consumption of brown sugar is great, considerable disappointment will be felt when the true character of that of the beet comes to be known. That character will undoubtedly be improved, especially in a country where the habits of the people demand a great deal of raw sugar. The beets will be better preserved, the machinery perfected, and the the selection of seeds and soils made with more intelligence and care. I have before me a specimen of the brown sugar of the beet, as full of saccharine, and as free from any bad taste, as any cane sugar I ever saw, and far more beautiful in its appearance. It is like a rich yellowish New Orleans brown, that I have occasionally seen in the American markets, only a shade whiter. I have also a speciment of *clayed* beet sugar, of a pure whiteness, and free from all ill-flavor. While, therefore, I state the general objection to the brown sugar of beets, I also say that, in a well-provided und well-conducted manufactory, from beets just dug, or very well preserved, brown sugar can be made as good, in every respect, as any from the cane, and far more beautiful and attractive in appearance.

The refining of sugar is not in any instance known to me connected with the manufacturing of it. I see no reason why they should be thought incompatible, especially as I am told that the same steam-engine would serve for both; and also for a third object, which I had not heard of until I come here, viz: the distillation of the refuse molasses into alcohol. This is not yet used for drinking, though I think it probable it will be converted to that use, but for making varnish, and other applications to the arts. This method of *utilizing* the molasses, after two or three deposites of sugar, is beginning to attract great attention among the sugar manufacturers.

The value of steam in the various operations of heating and evaporating, whether in the manufactory or refining of sugar, cannot be overrated. The superior economy of it although the first outlay is greater, cannot be questioned. It requires less fuel and fewer hands, and, in point of neatness, conveniance, and despatch, admits of no comparison with any other agent. A method of distilling by steam has been discovered and patented in Belgium, which is said to possess the same character of superiority over the common process by furnaces, as the use of steam in sugar manufacturing and refining.

I have paid some attention to refining, and, I think when I return to America I shall bring all the secrets about which L******* and his friend ******* made so much ado, and of which the former claimed to be the discoverer. I *guess* there was nothing but what Pedder got in England and France. The fact is, that the introduction and rapid improvement of the beet sugar manufacture in France have given such an impulse to invention and to chemical research, that it is morally impossible for one single year to pass without bringing forth something new and valuable in the arts of making and refining sugar. I am informed since my arrival here, that a great discovery has recently been made by a Frenchman in Brazil, who has lately returned to France and patented it. It consists in making and refining sugar *by one operation*. There are as many systems of sugar making here, as there are sects of Christians in America. A new one is lately introduced, which is supposed to be superior to all others. It is my intention to examine all, before I give a preference to any.

The most interesting aspect of the beet sugar business is its bearing upon agriculture and rural economy. It enriches the land, both as an excellent substitute for fallowing, and as producing an immense quantity of capital manure. It has the latter effect in various ways, but principally by feeding a large number of cattle and sheep. The former are fattened in three to three and a half months, in a manner really superb. So fine specimens of beef creatures are seldom seen in the United States, after six months of the best pasturing and stall-feeding. The sheep are fattened in six weeks.—At the manufactory where I have been, they pay, on an average, about six louis for cattle, and sell them for eleven. A louis is about $4 37. I suppose that this branch of the business would be quite as lucrative in the United States, where stock animals may be bought somewhat cheaper. This, you see, is doubling capital three times a year with the help, however, of the pulp, or pomace of the beet. This can be kept good any desirable length of time. It is sold here at ten cents the cwt.

The profit of raising the beets is very great, according to estimates which I have from the most intelligent sources. I do not find it so high as Mr. Pedder did. My data make the nett gain in France, after paying rent, ploughing, weeding, hoeing, digging, and preserving, 404 francs per hectare. This measure is a trifle over two English acres. Consequently, the profit of cultivating beets on an acre will be 202 francs—about. Can you wonder that land has risen from 50 to 150 per cent. in the districts of the sugar manufactories? The wages of labor for cultivating and manufacturing the produce of a hectare amount to $56 81. This would give for 100 acres $2,840, nearly; and for 400, which would be the quantity required for the largest establishments, $11,830, to say nothing of the profits of the proprietor or leaseholder, when he and the laborer are one and the same. In this case, besides getting pay for his labor, and the rent or interest of his land, he would receive $38 profit per acre. Wages will be higher in America, and the profits of the laborer and proprietor still more encouraging. In one manufactory which I visited, two-thirds of the hands were women, who are paid much less than men; but there is no reason why it should be so, for they do just as much work and just as well as men. They do the principal part of the weeding and dressing of the crop every where.

The company ought to send out their orders and funds for purchasing seeds pretty soon after the receipt of this letter. The price here is stated at thirteen cents per pound, but the general price for the season is not yet fixed. It is usually as regular as that of wheat, and I presume will settle down at something less than the above. The transportation, to Dunkirk, a convenient place for embarkation, would be three or four dollars for one thousand pounds. This would be enough to sow one hundred and sixty-six acres. A drill for the sowing would cost $110, but I have heard of a new instrument, which is said by some to be better, and will not cost above $20. The most material point in sowing is the manner of ploughing. The land must be ploughed eight inches deep at least, and this ought to be done in the month of August. Still fine crops of beets have been obtained by breaking up grass ground in the spring immediately before the seeding. The land should be turned up handsomely, and all the grass and other vegetable matter fairly deposited underneath. Then it must be harrowed deep and fine, but the same way with the furrows. If the furrows be disturbed, it spoils or greatly injures the crop. The seed is to be sown in rows, twenty inches apart, on the top of the furrows, and the same way with them. No plough must enter after the sowing, but the land must be dressed two to four times, according to its tendency to weediness, with the hand and hoe. The vegetable matters decay, and give their whole nourishment to the beets. I suppose these remarks may be of less consequence to the propietors of rich prairies of the west, than to those of the lands in France, and in the northern and middle states of America. There can be no doubt, however, that the decomposition of fresh vegetable matter will afford a more active stimulus to vegetable life than old mould, however rich. The land for beets must be *good*, but it may be too good. In this case it will produce beets of an enormous size, but hollow and decayed, and affording less saccharine than much smaller ones. Very poor land, made rich by manuring, is said to yield large beets, containing a great deal of potash and sal ammoniac, but very little sugar. At the first weeding, when the beets are about one or one and a half inches high, they must be thinned so as to leave one plant to every twelve or thirteen inches of row. If there be spaces where the seed has not come up, some of the plants pulled up should be transplanted into those spaces. There are some other considerations which it is material to suggest to you at this time. The first is the necessity of providing seasonably a store of *good bones*. In the proper making, washing, and otherwise cleansing and reburning of animal coal, consists the soul of a beet sugar manufactory. The best bones are those from kitchens, meat shops, dead horses and other dead animals thrown away. A Frenchman would make his fortune out of the dead hogs and dead dogs, which float every day in the East River. Fresh bones are the thing. Those which have been bleaching a good while in fields and highways are very nearly worthless. Those who intend to make beet sugar in the United States must look beforehand to the collection of bones. If they

should have more than they want, which is scarcely possible, they will have sufficient demand for the surplus. The profits of the manufacture of animal coal, though constantly declared to be little or nothing, are, nevertheless, carefully concealed. Bones are bought here at from half to one cent per pound.

A great deal of lime is used in the operations of the sugar manufactory, say from a peck to a bushel per day. It is well for manufacturers to make their own. It must be of finer quality than that used in masonry. The lime manufactured from the chips and waste pieces of marble is considered the purest of any made on a large scale. The convenience and economy of having your work situated upon navigable water will not have escaped the attention of yourself and associates. An abundance of pure water is required by a beet sugary, (*sucrerie*, the word commonly used by the French.) This may be taken from a river or canal if it be clean. Here it is generally taken from wells with forcing pumps worked by steam. The reason is, that the waters of the rivers and canals of this country are very dirty. In the mannfactory where I have hitherto been, the quantity used is about 15,000 gallons per day.

Seasonable provision must be made of bricks or wood for a building 150 feet long, 50 wide, and 20 high. Besides this, there will be a low part for a steam engine, for a furnace to re-burn the coal, and a kitchen where part of the utensils must be washed every day. This will be of the above length, and 15 feet in breadth. I am not yet satisfied what is the best plan for a building. I give the above dimensions as embracing sufficient materials for any form. I may hereafter think that it would be better to increase the height, and diminish the length. The walls should be thick and substantial, but clay mortar and second quality of brick are used.

The steam engine can be made as well in the United States as any where. It will be sufficient if the boiler be of 40-horse power, and the machine 12. Perhaps in the course of three or four years we should want greater powers; but, in that case, an exchange or sale could be easily made, and greater substituted, when operations are suspended, as they will be of course, during the spring and summer. Such an engine would be sufficient for working up 10,000,000 lbs. of beets per annum, producing not less than 500,000 lbs. of sugar. The engine ought to be delivered and the buildings commenced by the first of next July, if you intend to go on this year. I shall send drawings of an engine when I address you again. Several months later than July would be better than to let the year go by without beginning. If working were commenced this year, although little were done, every thing would be in readiness to go at it better next year, and you would proceed with confidence and satisfaction to make a large crop of beets. If no more were accomplished this year than merely to get together the utensils, set up the machinery, and make a fair trial of them for one week, it would be well worth the interest of the capital for one year, in the increased confidence, facility, and punctuality which it would impart to all the operations of the ensuing year. There are seven months from the last days of August, (at which I should prefer to begin.) in the very last week of which you might make the experiment of which I speak, and enable yourself to detect any faults or deficiencies, and remedy them against the coming year.

There are portions of the machinery which it would perhaps be advisable, if not necessary, to procure in this country, in order that they might be good, and serve as models to mechanics who have no experience in the matter; thus American mechanics would be able to execute additional ones as they should be wanted. I will name the principal articles which would be indispensable to a beginning on the smallest scale, suppose you to procure the steam engine in the United States. They are those which could not, I think, be well made in the United States, nor made in any manner there without great delay, trouble, and, in all probability, greater expense than would be incurred in getting them here: 1 rasp, $200; 2 presses, $1,200; 1 table, $75; 1 desiccating kettle, $250; 1 evaporating trough, $200; 1 boiler, $150; 1 cooler, $100. Total, $2,175.

I would also suggest to the company that I be authorized to engage one or two good workmen. They could be had for less than a common laborer in the United States, and they are willing to make considerable sacrifices for the sake of getting to our country.

And now, my dear friend, I believe I have said as much as is needful at this time. I shall address you again at no distant day. I propose to continue in this place about three months, and return to the United States in all of May and June. It is my wish, not only to perfect myself in all the operations of the beet sugary, but also to observe the *several systems* which exist, and compare them with one another. I shall return to the United States by way of England, chiefly for the purpose of conferring with an eminent chemist, who has kindly proposed to instruct me in a new method of refining, which he has discovered and patented.

I am affectionately, your friend,

D. L. CHILD.

GEO. KIMBALL, ESQ.

From the Genesee Farmer.

AMERICAN FLORA.

It is a well known fact that America possesses many of Flora's richest gems; and it is to be regretted that while they are such universal favorites in every other country, our own gardens present such a barren exhibition of native plants, while we find them frequently compactly filled with the productions of other climes, their inferiors in every respect.

To show the passion that exists for our splendid native plants, we may here remark, that a few days ago we received a visit from Mr. Alexander Gordon, formerly a contributor to the pages of this paper, and who now dedicates his time solely to collecting our indigenous plants for European establishments, and has at this time orders for above fifty thousand plants, from various nurserymen in Britain, France, &c.

Mr. G. informed us that every section of this country abounds with a great variety of plants which are in universal demand in Europe, in every botanical establishment, and sought after with avidity. He is now on a most extensive tour, and purposes exploring the Atlantic states,

the Floridas, and thence to go to the island of Cuba, which island he has already visited, and found peculiarly rich in choice plants, many hitherto unknown to botanists.

Therefore, when our own woods, mountains and valleys are so peculiarly rich in nature's beauties, why not ornament our gardens from this source, which affords to other countries, their very richest ornaments—even to such an extent that in extensive gardens it is no uncommon circumstance to find acres dedicated solely to the native plants of this country and distinguished by the appellation of the *American garden.* We hope these remarks will receive the attention of our readers in general, particularly such as delight in the most pleasing pursuit of ornamenting their gardens with the beauties of nature.

For the Farmers' Register.

DESULTORY OBSERVATIONS ON THE POLICE OF HEALTH, IN VIRGINIA—AS IT IS, AND AS IT OUGHT TO BE.

By the Editor.

Introductory remarks.

The greater and more important part of the first of the following papers (marked No. I of the sesies,) has been already twice laid before the public. The first publication consisted principally of theoretical views, then but little sustained by known facts, and not at all by any known authority, and was presented in the first volume of the Farmers' Register (page 76) as a "Supplementary Chapter to the *Essay on Calcareous Manures.*" The second publication was embodied in the second edition of the *Essay*, much extended, especially in the testimony of facts—and which will here be given unchanged, except by the addition of some new passages, of argument and illustration. It may require apology for thus embracing matter that is already in the possession of many of the most inquiring and intelligent readers. But on the other hand, very many persons have not seen, and cannot readily have access to either publication—and moreover, as presenting general principles, this portion is most suitable to precede and introduce the practical applications that will follow. General reasoning and propositions, or instructions in a didactic form, are always less impressive, and less likely to be useful, than when applied to actual and well known facts and circumstances. It is to supply the latter deficiency, and to endeavor to attract the attention of those most interested in this subject, the residents of towns, that the succeeding portion is now offered. Of this numerous class, few have given any attention to either of the previous publications, merely because they were *agricultural*, and therefore erroneously supposed to be of no value to mere townsmen. But though the matters treated are of high importance to agriculture, as offering rich sources of fertility to the country, they also are of not less importance to towns *directly, by preserving cleanliness* and *guarding health*, as well as *indirectly*, in fertilizing all the lands of their vicinity. If the views maintained should ever be acted on extensively, and to much public benefit, it must be by townsmen, and especially by town magistracies and councils leading the way in the work. It is therefore, that I most earnestly ask the attention especially of the residents of towns; and if attention is given, I hope to prove that they can greatly aid their own individual comforts, and pecuniary interests, by adopting a general system of economical police that will also improve agriculture, and enrich a large portion of the neighboring country.

Under the general head of the "Police of health in Virginia," I propose to treat, 1st of the general action and effects of calcareous matter in preventing the wasteful and injurious decomposition of animal and vegetable matters; 2ndly, of applications of these principles to the police of towns especially; and 3rdly, of the causes of autumnal diseases in the country generally, and the means for removing them. The last proposed part may be delayed for the gathering of more numerous facts; and the whole subject will be treated in the desultory and irregular manner admissible in presenting the early views of a new subject, that will require much more investigation and discussion, before it can be given a methodical and well digested form.

No. I.

The action and effects of calcareous earth in preserving putrescent matters and thereby promoting cleanliness and health.

This first number, as stated above, being merely a portion (chap. xix,) somewhat enlarged, of the second edition of the *Essay on Calcareous Manures*, the language is in some passages better suited to its former than its present position. The general theory of the action of calcareous earth, in producing fertilization of soil, is considered as established by the earlier and larger portion of the *Essay*, and therefore will be taken as established grounds throughout these observations, and not as a subject yet to be proved, or even discussed. It will merely be here stated generally, that the most important positions maintained in that work are these: that calcareous earth (carbonate of lime) has the property of combining with the products of all putrefying animal and vegetable matters, and thus preserving them from waste, and securing them for enriching the soil and feeding vegetation; and that other earths (sand, clay, &c.) have no such chemical action on putrescent matters, and cannot retain them, or profit fully by their value, for enriching soil, except by the addition and aid of calcareous earth.

The operation of calcareous earth in enriching barren soils, has been traced, in a former part of this essay, to the chemical power possessed by that earth of combining with putrescent matters, or with the products of their fermentation—and in that manner, preserving them from waste, for the use of the soil, and for the food of growing plants. That power was exemplified by the details of an experiment, (page 31,) in which the carcass of an animal was so acted on, and its enriching properties secured. That trial of the putrefaction of animal matter in contact with calcareous earth, was commenced with a view to results very different from those which were obtained. Darwin says that *nitrous acid* is produced in the process of fermentation, and he supposes the *nitrate of lime* to be very servicable to vegetation.* As the ni-

* Darwin's Phytologia, pp. 210 and 224. Dublin dition.

trous acid is a gas, it must pass off into the air, under ordinary circumstanees, as fast as it is formed, and be entirely lost. But as it is strongly attracted by lime, it was supposed that a cover of calcareous earth would arrest it, and form a new combination, which, if not precisely nitrate of lime, would at least be composed of the same elements, though in different proportions. To ascertain whether any such combination had taken place, when the manure was used, a handful of the marl was taken, which had been in immediate contact with the carcass, and thrown into a glass of hot water. After remaining half an hour, the fluid was poured off, filtered, and evoporated, and left a considerable proportion of a white soluble salt (supposed eight or ten grains). I could not ascertain its kind—but it was not deliquescent, and therefore could not have been the nitrate of lime. The spot on which the carcass lay, was so strongly impregnated by this salt, that it remained bare of vegetation for several years, and until the field was ploughed up for cultivation.

But whatever were the products of fermentation saved by this experiment, the absence of all offensive effluvia throughout the process sufficiently proved that little or nothing was lost—as every atom must be, when flesh putrefies in the open air: and I presume that a cover of equal thickness of clay, or sand, or any mixture of both, without calcareous earth, would have had very little effect in arresting and retaining the aeriform products of putrefaction. All the circumstances of this experiment, and particularly the good effect exhibited by the manure when put to use, prove the propriety of extending a similar practice. In the neighborhood of towns, or wherever else the carcasses of animals, or any other animal substances subject to rapid and wasteful fermentation, can be obtained in great quantity, all their enriching powers might be secured, by depositing then between layers of marl, or calcareous earth in any other form. On the borders of the Chowan, immense quantities of herrings are often used as manure, when purchasers cannot take off the myriads supplied by the seines. A herring is buried under each corn-hill, and fine crops are thus made, as far as this singular mode of manuring is extended. But whatever benefits may have been thus derived, the sense of smelling, as well as the known chemical products of the process of animal putrefaction, make it certain that nine-tenths of all this rich manure, when so applied, must be wasted in the air. If those who fortunately possess this supply of animal manure, would cause the fermentation to take place, and be completed, mixed with and enclosed by marl, in pits of suitable size, they would increase prodigiously both the amount and permanency of their acting animal manure, besides obtaining the benefit of the calcareous earth mixed with it.

But without regarding such uncommon, or abundant sources for supplying animal matter, every farmer may considerably increase his stock of putrescent manure, by using the preservative power of marl; and all the substances that might be so saved, are not only now lost to the land, but serve to contaminate the air while putrefying, and perhaps to engender diseases. The last consideration is of most importance to towns, though worthy of attention every where. Whoever will make the trial, will be surprised to find how much putrescent matter may be collected from the dwelling house, kitchen, and laundry of a family; and which if accumulated (without mixture with calcareous earth,) will soon become so offensive as to prove the necessity of putting an end to the practice. Yet it must be admitted that when all such matters are scattered about, (as is usual both in town and country,) over an extended surface, the same putrefaction must ensue, and the same noxious effluvia be evolved, though not enough concentrated to be very offensive, or even always perceptible. The same amount is inhaled—but in a very diluted state, and in small, though incesantly repeated doses. But if mild calcareous earth in any form (and fossil shells or marl present much the cheapest,) is used to cover and mix with the putrescent matters so collected, they will be prevented from discharging offensive effluvia, and preserved to enrich the soil. A malignant and ever acting enemy will be converted to a friend and benefactor.

The usual dispersion and waste of such putrescent and excrementitous matters about a farmhouse, though a considerable loss to agriculture, may take place without being very offensive to the senses, or certainly injurious to health. But the case is widely different in towns. There, unless great care is continually used to remove or destroy filth of every kind, it soon becomes offensive, if not pestilential. During the last summer (1832) when that most horrible scourge of the human race, the Asiatic cholera, was desolating some of the towns of the United States, and all expected to be visited by its fatal ravages, great and unusual exertions were every where used to remove and prevent the accumulation of filth, which if allowed to remain, it was supposed would invite the approach, and aid the effects of the pestilence. The efforts made for that purpose served to show what a vast amount of putrescent matter existed in every town, and which was so rapidly reproduced, that its complete riddance was impossible. Immense quantities of the richest manures, or materials for them, were washed away into the rivers—caustic lime was used to destroy them—and the chloride of lime to decompose the offensive products of their fermentation, when that process had already occurred. All this amount of labor and expense was directed to the complete destruction of what might have given fertility to many adjacent fields—and yet it served to cleanse the towns but imperfectly, and for a very short time. Yet the object in view might have been better attained by the previous adoption of the proper means for preserving these putrescent matters, than by destroying them.—These means would be to mix or cover all accumulations of such matters with rich marl, (which would be the better for the purpose if its shells were in small particles,) and in such quantity as the effect would show to be sufficient. But much the greater part of the filth of a town is not, and cannot be accumulated; and from being dispersed, is the most difficult to remove, and is probably the most noxious in its usual course of fermentation. This would be guarded against by covering thickly with marl the floor of every cellar and stable, back yard, and stable lot. Every other vacant space should be lightly covered. The same course pursued on the gardens and other cultivated grounds, would be sufficiently compensated by the

increased products that would be obtained: but independent of that consideration, the manures there applied would be prevented from escaping into the air—and being wholly retained by the soil, much smaller applications would serve. The level streets ought also to be sprinkled with marl, and as often as circumstances might require. The various putrescent matters usually left in the streets of a town, alone serve to make the mud scraped from them a valuable manure; for the principal part of the bulk of street mud is composed merely of the barren clay brought in upon the wheels of wagons from the country. Such a cover of calcareous earth would be the most effectual absorbent and preserver of putrescent matter, as well as the cheapest mode of keeping a town always clean. There would be less noxious or offensive effluvia, than is generated in spite of all the ordinary means of prevention; and by scraping up and removing the marl after it had combined with and secured enough of putrescent matter, a compost would be obtained for the use of the surrounding country, so rich and so abundant, that its use would repay a large part, if not the whole of the expense incurred in its production. Probably one covering of marl for each year would serve for most yards, &c. but if required oftener, it would only prove the necessity for the operation, and show the greater value in the results. The compost that might be obtained from spaces equal to five hundred acres in a populous town, would durably enrich thrice as many acres of the adjacent country: and after twenty years of such a course, the surrounding farms might be capable of returning to the town a ten-fold increased surplus product. After the qualities and value of the manure so formed were properly estimated, it would be used for farms that would be out of reach of all other calcareous manures. Carts bringing country produce to market, might, with profit, carry back loads of this compost eight or ten miles. The annual supply that the country might be furnished with, would produce very different effects from the putrescent and fleeting manure now obtained from the town stables. Of the little durable benefit heretofore derived from such means, the appearance of the country offers sufficient testimony. At three miles distance from some of the principal towns in Virginia, more than half the cultivated land is too poor to yield any farming profit. The surplus grain sent to market is very inconsiderable—and the coarse hay from the wet meadows can only be sold to those who feed horses belonging to other persons—and to whom that kind of hay is the most desirable, that is least likely to be eaten.

But even if the waste and destruction of manure in towns were counted as nothing, and the preservation of health, by keeping the air pure, were the only object sought, still calcareous earth, as presented by rich marl, would serve the purpose far better than quicklime. It is true, that the latter substance acts powerfully in decomposing putrescent animal matter, and destroys its texture and qualities so completely, that the operation is commonly and expressively called "burning" the substance acted on. But to use a sufficient quantity of quicklime to meet and decompose all putrescent animal matter in a town, would be intolerably expensive, and still more objectionable in other respects. If a cover of dry quicklime in powder was spread over all the surfaces requiring it for this purpose, the town would be unfit to live in; and the nuisance would be scarcely less, when rain had changed the suffocating dust to an adhesive mortar. Woollen clothing, carpets, and even living flesh would be continually sustaining injury from the contact. No such objections would attend the use of mild calcareous earth; and this could be obtained probably for less than one-fifth of the cost of quicklime, supposing an equal quantity of pure calcareous matter to be obtained in each case. At this time the richest marl on James River may be obtained at merely the cost of digging, and its carriage by water, which if undertaken on a large scale, could not exceed, and probably would not equal three cents the bushel.

The putrescent animal matters that would be preserved and rendered innoxious by the general marling of the site of a town, would be mostly such as are so dispersed and imperceptible that they would otherwise be entirely lost. But all such as are usually saved in part, would be doubled in quantity and value, and deprived of their offensive and noxious qualities, by being kept mixed with calcareous earth. The importance of this plan being adopted with the products of privies, &c. is still greater in town than country. The various matters so collected and combined should never be applied to the soil alone, as the salt derived from the kitchen, and the potash and soap from the laundry, might be injurious in so concentrated a form. When the pit for receiving this compound is emptied, the contents should be spread over other and weaker manure, before being applied to the field.

Towns might furnish many other kinds of rich manure, which are now lost entirely. Some of these particularly require the aid of calcareous earth to be secured from destruction by putrefaction, and others, though not putrescent, are equally wasted. The blood of slaughtered animals, and the waste and rejected articles of wool, hair, feathers, skin, horn and bones, all are manures of great richness. We not only give the flesh of dead animals to infect the air, instead of using it to fertilize the land, but their bones, which might be so easily saved, are completely thrown away. Bones are composed of phosphate of lime and gelatinous animal matter, and when crushed, form one of the richest and most convenient manures in the world. They are shipped in quantities from the continent of Europe, to be sold for manure in England. The fields of battle have been gleaned, and their shallow graves emptied, for this purpose: and the bones of the ten thousand British heroes who fell on the field of Waterloo, are now performing the less glorious, but more useful purpose of producing, as manure, bread for their brothers at home.

There prevails a vulgar but useful superstition, that there is "bad luck" in throwing into the fire any thing, however small may be its amount or value, that can serve for the food of any living animal. It is a pity that the same belief does not extend to every thing that, as manure, can serve to feed growing plants—and that even the parings of nails and clippings of beards are not used (as in China) in aid of this object. However small each particular source might be, the amount of all the manures that might be saved, and which are now wasted, would add incalculably to the usual

means for fertilization. Human excrement, which is scarcely used at all in this country, is stated to be even richer than that of birds; and if all the enriching matters were preserved that are derived not only from the food, but from all the habits of man, there can be no question but that a town of ten thousand inhabitants, from those sources alone, might enrich more land than could be done from as many cattle.

The opinions here presented are principally founded on the theory of the operation of calcareous manures, as maintained in the foregoing part of this essay: but they are also sustained to considerable extent by facts and experience. The most undeniable practical proof of one of my positions, is the power of a cover of marl to prevent the escape of all offensive effluvia from the most putrescent animal matters. Of this power I have made continued use for about eighteen months, and know it to be more effectual than quicklime, even if the destructive action of the latter was not objectionable. Quicklime forms new combinations with putrescent substances, and in thus combining, throws off effluvia, which though different from the products of putrescent matter alone, are still disagreeable and offensive. Mild lime, on the contrary, absorbs and preserves every thing—or at least prevents the escape of any offensive odor being perceived. Whether putrescent vegetable matter is acted on in like manner by calcareous earth, cannot be as well tested by our senses, and therefore the proof is less satisfactory. But if it is true that calcareous earth acts by combining putrescent matters with the soil, and thus preventing their loss, (as I have endeavored to prove in chapter viii.) it must follow, that to the extent of such combination, the formation and escape of all volatile products of putrefaction will also be prevented.

But it will be considered that the most important inquiry remains to be answered. Has the application of calcareous manures been found, in practice, decidedly beneficial to the health of the residents on the land? I answer, that long experience, and the collection and comparison of numerous facts, derived from various sources, will be required to remove all doubts from this question; and it would be presumtuous in any individual to offer, as sufficient proof, the experience of only ten or twelve years on any one farm. But while admitting the insufficiency of such testimony, I assert that, so far, my experience decidedly supports my position. My principal farm, until within some four or five years, was subject in a remarkable degree to the common mild autumnal diseases of our low country. Whether it is owing to marling or other unknown causes, these bilious diseases have since become comparatively very rare. Neither does my opinion in this respect, nor the facts that have occurred on my farm, stand alone. Some other persons are equally convinced of this change on other land as well as on mine. But in most cases where I have made inquiries as to such results, nothing decisive had been observed. The hope that other persons may be induced to observe and report facts bearing on this important point, has in part caused the appearance of these crude and perhaps premature views. [1833]

Even if my opinions and reasoning should appear sound, I am aware that the practical application is not to be looked for soon; and that the scheme of using marl in towns is more likely to be met by ridicule, than to receive a serious and attentive examination. Notwithstanding this anticipation, and however hopeless of making converts either of individuals or of corporate bodies, I will offer a few concluding remarks on the most obvious objections to, and benefits of the plan. The objections will all be resolved into one—namely, the expense to be encountered. The expense certainly would be considerable; but it would be amply compensated by the gains and benefits. In the first place the general use of marl as proposed for towns, would serve to insure cleanliness, and purity of the air, more than all the labor of their Boards of Health and their scavengers, even when acting under the dread of approaching pestilence. Secondly, the putrescent manures produced in towns, by being merely preserved from waste, would be increased ten-fold in quantity and value. Thirdly, all existing nuisances and abominations of filth would be at end, and the beautiful city of Richmond (for example) would not give offence to our nostrils, almost as often as it offers gratification to our eyes. Lastly, the marl after being used until saturated with putrescent matter, would retain all its first value as calcareous earth, and be well worth purchasing and removing to the adjacent farms, independent of the enriching manure with which it would be loaded. If these advantages can indeed be obtained, they would be cheaply bought at any price necessary to be encountered for the purpose.

Most of the foregoing part of this chapter was first published in the Farmers' Register, (for July 1833,) and as supplementary to this Essay. That publication drew some attention from others to the subject, and served to elicit many important facts, of which I had been before altogether ignorant, in support of the operation of calcareous earth in arresting the effects of *malaria*, and the usual autumnal diseases of the southern states, and other similar regions. These facts, together with the results of my own personal experience, extended through two more autumns (or sickly seasons as commonly called here and farther south,) since the first publication of these views, will now be submitted. Most of the facts derived from other persons relate to one region—the "rotten limestone lands" of southern Alabama: but that region is extensive, of remarkable and well known character and peculiarities, and the evidence comes from various sources, and is full, and consistent in purport. The facts will be here embodied, and the more important statements from which they are drawn, will be presented more fully in the Appendix. [See N.]

The first fact brought out, was, that in the town of Mobile, near the Gulf of Mexico, the streets actually had been paved with shells—thus presenting precisely such a case as I recommended; though it had not been done with any view to promoting cleanliness or health. The shells had been used merely as a substitute for stones, which not be so cheaply obtained. Nor had the greatly improved healthliness of Mobile since the streets were so covered, (of which there is the most ample and undoubted testimony,) been attributed to that cause, until the publication of the foregoing opinions served to connect them, as cause and effect. This can scarcely be doubted by those who will admit the theory of the action of calca-

reous earth; and the remarkable change from unhealthiness in Mobile, to comparative healthiness, is a very strong exemplification of the truth of the theory. But it is not strange, that when so many other causes might (and probably did) operate to arrest diseases, that none should have considered the chemical operation of the shelly pavement as one of them, and still less as the one by far the most important. The paving of streets, (with any material,) draining and filling up wet places, substituting for rotting wooden buildings new ones of brick and stone—and especially the operation of destructive and extensive fires—all operate we know, (and particularly the last,) to improve the healthiness of towns; and all these operated at Mobile, as well as shelling the streets. Neither was the shelling so ordered as to produce its best effect for health. The streets, alleys, and many yards and small vacant lots were covered, and so far the formation and evolving of pestilential effluvia were lessened. But as this was not the object in view, and indeed the chemical action of shells was not thought of, the process was incomplete, and must necessarily be less effectual than it might have been made. The shelling ought to have been extended to every open spot where filth could accumulate—to every back yard, to every cellar, and made the material of the floor of every stable, and of all other buildings of which the floor would otherwise be of common earth. In addition, after a sufficient lapse of time to saturate with putrescent matters the upper part of the calcareous layer, and thus to make it a very rich compound, there should be a partial or total removal of the mass, and a new coating of shells laid down. The value of the old material, as manure, would probably go far towards paying for this renewal: and if it is not so renewed, the calcareous matter cannot combine with more than a certain amount of putrescent matters—and after being so saturated, can have no farther effect in saving such matters for use, or preventing them from having their usual evil course.

The burning of towns is well known to be a cause of the healthiness of the places being greatly improved, and that that effect continues after as many buildings, or more, have replaced those destroyed by fire. Indeed this improvement is considered so permanent, as well as considerable, that the most sweeping and destructive conflagrations of some of our southern towns, have been afterwards acknowledged to have proved a gain, and a blessing. The principal and immediate mode of operation of this universally acknowledged cause, is usually supposed to be the total destruction, by the fire, of all filth and putrescent matters—and in a less degree, and more gradually, by afterwards substituting brick and stone for wooden buildings, which are always in a more or less decaying state. But though these reasons have served heretofore to satisfy all, as to the beneficial consequences of fires, surely they are altogether inadequate as causes for such great and durable effects. The mere destruction of all putrescent matters in a town, at any one time, would certainly leave a clear atmosphere, and give strong assurance of health being improved for a short time afterwards: but these matters would be replaced, probably in the course of few months, by the residence of as many inhabitants, and the continuance of the same general habits—and most certainly this cause would lose all its operation by the time the town was rebuilt. But there is one operation produced by the burning of a town, which is far more powerful—which in fact is indirectly the very practice which has been advocated—and the effect of which, if given its due weight, furnishes proof of the theory set forth, by the experience of every unhealthy town which has suffered much from fire. If any estimate is made of the immense quantity of mild calcareous earth which is contained in the plastering and brickwork of even the wooden dwelling houses of a town, (and still more of those built of masonry) it must be admitted that all that material being separated, broken down, and (soon or late,) spread by the burning of the houses and pulling down of their ruins, is enough to give a very heavy cover of calcareous earth to the whole space of land burnt over. It is to this operation, in a far greater degree than to all others, that I attribute the beneficial effects to health of the burning of towns.

I proceed to the facts derived from the extensive body of prairie lands in Alabama which rest on a substratum of soft limestone, or rich indurated clay marl. It was from these remarkable soils that the specimens were obtained which were described at page 22. Some of these, indeed all that have been examined by chemical tests of the high and dry prairie lands, contain calcareous earth in larger proportions than any soils of considerable extent in the United States that I have seen, or tested. The specimens not containing free calcareous earth are of the class of neutral soils; and the calcareous earth, which doubtless they formerly contained, and from which they derived their peculiar and valuable qualities, may be supposed only to be concealed by the accumulation of vegetable matter, according to the general views submitted in chapter vii. The more full descriptions of the soils of this remarkable and extensive region which will be placed in the Appendix [at N] render it unnecessary to enlarge much here. It will be sufficient to sum up concisely the facts there exhibited—and which agree with various other private accounts which have been received from undoubted sources of information. The deductions from these facts, and their accordance with the theory of the operation of calcareous matter, are matters of reasoning, and as such, are submitted to the consideration and judgment of readers.

The soil of these prairie lands is very rich, except the spots where the soft limestone rises to the surface, and makes the calcareous ingredient excessive: in the specimen formerly mentioned, the pure calcareous matter formed 59 parts in the hundred of this "bald prairie" land. The soil generally has so little of sand, that nothing but the calcareous matter, which enters so largely into its composition, prevents it being so stiff and intractable, that its tillage would be almost impracticable; yet it is friable and light when dry, and easy to till. But the superfluous rain water cannot sink and pass off, as in sandy or other pervious lands, but is held in this close and highly absorbent soil, which throughout winter is thereby made a deep mire, unfit to prepare for tillage, and scarcely practicable to travel over. This water-holding quality of the soil, and the nearness to the surface of the hard marly substratum, deprive the

country of natural springs and running streams: and before the important discovery was made that pure water might be obtained by boring from 300 to 700 feet through the solid calcareous rock, the inhabitants used the stagnant water collected in pits, which was very far from pure, or palatable. Under all these circumstances, added to the rank herbage of millions of acres annually dying and decomposing under a southern sun, it might have been counted on, as almost certain, that such a country would have proved very unhealthy: yet the reverse is the fact, and in a remarkable degree. The healthiness of this region is so connected with, and limited by, the calcareous substratum and soil, that it could not escape observation: and they have been considered as cause and effect by those who had no theory to support, and who did not spend a thought upon the mode in which was produced the important result which they so readily admitted. Their testimony therefore is in this respect the more valuable, because it cannot be suspected. The intelligent author of the extract from the *Southern Agriculturist*, which will be given in the Appendix [N] is altogether unknown to me—and it is presumed that he had never heard of this Essay, nor of these views of the action of calcareous earth.

After adducing the foregoing mass of evidence, for which I am indebted to others, it will appear very unimportant to add what will follow from my personal observation—especially, as the opinion has been expressed above, that the experience of any one individual, on any one farm, or in any one location, though continued for ten or twelve years, must be very insufficient as proof of a permanent change of healthiness, and of the actual causes of such changes. But, as in the absence of more striking facts, and of practical proofs, my own limited experience was formerly brought forward—it is proper here to add, that the two autumns that have since passed, have brought no circumstances to weaken the opinions advanced, and many that have served, on the contrary, to strengthen them. [1835]

On my principal farm, Coggin's Point, the position of the homestead was always most inconveniently situated, and became the more so as the clearing and improvement of the poorer and more remote parts of the land were extended. For this reason, in addition to others, the farm buildings, and negroes' dwellings had been gradually removed, as the expense could be best encountered, until the old homestead was entirely abandoned in 1831, for a more eligible location. This would prevent the different degree of healthiness found here, before and since marling, from presenting a fair statement of proof. But still, there is no doubt of the general results showing a great and decided improvement in respect to health—and this was evident, before as well as since the removal of the dwelling place of the slaves. The greater number of these had been moved to an intermediate location, (with a view to health) before these benefits of marling were either felt, or anticipated—where a portion of them remained until within the last few years: and the circumstences attending this location, furnish ground for the opinion maintained, which is not liable to the objection referred to.

The poorer farm (Shellbanks) which was made a summer residence for my family in 1828 and the two succeeding years, and a permanent dwelling place since 1831, was marled to the extent of 120 acres, including all the land around the houses, in 1828; and in a few succeeding years, the space marled amounted to more than 300 acres. During this time, the yard was covered heavily with marl—and in 1832, when the approach of Asiatic cholera caused such alarm, the floor of the cellar of the house, (which is very damp,) the stable floor, and stable yard, were also covered, and every other vacant spot. In addition, the plan of collecting, for manure, all putrescent animal matters in a pit, and covering or mixing them frequently with marl, has been pursued for several years, though not with as much care and economy as ought to be used. In this pit, for experiment as much as for profit, the carcasses of animals have been several times placed, and preserved (as before) from giving out any offensive odor, merely by the covering of marl, until their very slow decomposition was at an end The health of the family, during the first two or three autumns, was about as good as on what are considered healthy places in the tide-water region of Virginia—all of which are more or less subject to bilious disorders in autumn, though deserving well (as indeed does the whole country) to be considered more than usually exempt from all other diseases. We had among the members of a large family, some intermittents, and some more severe bilious fevers during that time. But there has been a still greater and unlooked for improvement since—and for the last two years, I believe that all residing permanently at this place, have enjoyed as good health, as could be hoped for in any situation in the United States. Among the domestic servants and their young children, last autumn, there were a few slight agues, (which were attributed to some of those acts of imprudence to which negroes are so notoriously addicted, even if not necessarily exposed,) and which were scarcely worth notice, but as exceptions to the general healthiness. The land not being then tilled, there were no field laborers. Among my own large family, and other white persons who were permanent residents, there was not a single ague, or the slightest disease to be counted as one of climate, or proceeding from *malaria*. But I repeat, that many such facts are necessary, and much time, and the testimony of many different persons from various places to be brought together, before the causes can be fully admitted of such mysterious effects, as disease and its removal. It is to be hoped that the facts and deductions here presented, however defective, may at least, serve to attract the attention of many other, and more competent investigators, to this highly important subject.

To the time when this last publication is made, (June, 1837,) there has been no reason to doubt the actual facts of autumnal diseases (the effects of *malaria*,) being lessened by even the partial use of marling—nor the inference that they would almost cease to occur (where no mill-ponds and undrained lands existed,) if all the surface of a considerable extent of country were made calcareous, and all rapidly putrescent and otherwise offensive matter were preserved and kept harmless by being combined with marl, applied from time to time, as required. But it should be remembered, that, as yet, there has been no instance of the greater part of any whole neighborhood, of

so much as a few miles in extent, being marled; nor even of all the surface of any one farm; and that, therefore, we have no means of judging by experience of the full measure of benefit to be derived from such a general change of the character of the soil. The most that has yet been done, any where, is the marling of all the cultivated and arable land—leaving unmarled, and as much as ever the abundant sources of vegetable decomposition and of disease, all the woodland, hill-sides, and the wet bottoms. Now, as the remaining woodlands are generally among the poorest of our soils, that is, (according to the theory maintained,) soils incapable of combining with and retaining the products of decomposition—and as they are covered annually with leaves, which in time all rot and finally pass off into the air—it follows, that the lands so left are among the most fruitful of malaria. It is obvious that the remedy is but partially and inefficiently in operation, while from one third to one half of every farm is left unmarled, and free as ever to evolve the cause of disease. So sure does this opinion seem to me, that I have commenced acting on it, by marling the woodland that is not designed to be cleared for cultivation—and shall continue, as more necessary labors permit, to do so, until not an acre of the farm is left without being changed in character by calcareous earth.

It is proper to add, as an opinion founded on but limited experience, as yet, that though the cases of sickness on Coggins' Point Farm, have certainly diminished very greatly—there not being one case recently, where there formerly were ten, or perhaps twenty—still that the diseases seemed to have changed in kind, and to have increased in severity and danger. Formerly, there was almost no sickness except from ague and fever (or very rarely, a case of mild bilious fever,) which, though few persons escaped from through the autumn, and some suffered several relapses, the attacks, were never dangerous, and required little skill, and but a few days, to cure, for that time. Bad as was this state of things, it seemed that the ague and fever acted as a safety-valve to the system, and while it seldom permitted the enjoyment of long continued robust health, it prevented the occurrence of more dangerous or fatal diseases, such as are the most common among the fewer diseases of what are deemed healthy regions. The diseases of my negroes for the last six or eight years have been of a more inflammatory kind, and are not confined to autumn: and there have been certainly more severe and fatal diseases, and more that have had medical aid, than formerly, when there was so much more of sickness of one kind, and at one season. In short, it seems that the diseases are no longer (or but in few cases,) those of the low country and of a bilious climate, but are like those of the upper country, which, though occurring but rarely, are generally of a serious nature. The facts on which this particular opinion has been formed, are yet too few, and of too short continuance, to attach to them much importance; and even if they were less doubtful, I have not the medical knowledge to trace these new effects back to their causes. Still, it is deemed due to candor, and to the desire for a fair and full investigation of the subject, even if making against my own views, that these opinions should be stated. There is no other subject, than this, taken in general, which more deserves and requires investigation—and in the present inchoate state of the discussion, the expression of even erroneous opinions will not be useless, if it should serve to elicit more full or correct ones from other sources.

Since November, 1835, I have ceased to reside on Shellbanks farm, and therefore have no later personal experience of the continued effect of marling in preventing the formation of the seeds of autumnal diseases. But it is understood from a physician, Dr. John S. Epes, who has since rented and resided on the farm, that it has maintained its reputation for a remarkable exemption from those diseases. The last summer and autumn (1836,) were unusually sickly throughout most of the surrounding neighborhood, and the residents of Shellbanks did not escape the visitation; but nearly all of their cases were entirely different from the diseases which were general in autumn, before marling the land. Nor can entire and continued exemption, even from the diseases caused by *malaria*, be reasonably counted on any where, (according to the views submitted above,) while the greater part of the surrounding and adjacent lands remain unmarled, and in their original state of unfruitfulness in every thing, save the poisonous products of vegetable decomposition.

When my opinions of the beneficial operation of calcareous earth, in soil, or mixed with putrescent matter, in destroying or disarming the sources of disease, were first published, and until after the last publication of the same in the *Essay on Calcareous Manures*, I had no knowledge that similar grounds had been taken by any other person. But since, in the recent publications of a French writer, M. Puvis, I have found the same general opinion expressed, and many important facts given in confirmation. These views are presented at length in the several articles translated from Puvis in the 3rd and 4th volumes of the Farmers' Register—to which it is enough here to refer, and to request the recurrence or attention of those readers who desire more extended statements and proofs of this highly important effect of calcareous earth as an ingredient of soil.*

No. II.

The police of filth in towns, and its bearing on comfort, decency and health.

The delightful season of opening summer has arrived, and the face of the earth, as formed by nature, and not deformed by man, is seen in its fairest aspect and brightest colors. Every thing shows life, in youth and beauty, and nothing yet exhibits indications of decay. Every feature of the natural landscape, in every region, however varied, is beautiful to the eye. The most barren and worthless of our lands, though the most wretched in appearance after cultivation, before being touched by man, are covered with magnificent forests. Nature has not made a scene that is displeasing to the eye; and even this granite region, barren and unsightly as much of it now is, was once one wide scene of universal beauty. It is man that wastes the beauties and blessings of na-

* See Puvis "*On Lime as manure*," translated, in Farmers' Register, vol. iii, pp. 359 to 366, and 385 to 392—and "*On Marl*," pp. 690 to 696, and 705 to 700, vol. iii—and pp. to , vol. iv.

ture, and deforms and defiles whatever he touches.

The opening of summer in our towns, presents a very different aspect, and is accompanied with very different associations. It is true, that some beautiful gardens are seen, in which the hand of man (or more generally of woman) has improved on nature, by bringing together, in numbers, nature's choicest ornaments. But these are exceptions to the general appearance. The broad sloppy flats, receptacles of collected rain water and oozes from hill-sides, which during winter and spring merely barred the way of walkers, or, at worst, gave them wet feet, and colds and pleurisies, now are drying up, without the Corporation being put to the cost of the small amount of ditching that would have kept the ground dry at all times. A "green mantle" overspreads the standing pools—and all will soon become a naked, ugly, and foul-scented mud. The thickly settled and commercial parts of towns may, perhaps, have nothing visible worse than men, and merchandize, brick houses, and paved streets: but all the out-skirts and vacant places are full of abominations to cleanliness and health, and of offence to the nostrils as well as to the eyes. The commencement of warm weather gives activity to decomposition, and the soft air is redolent of its products: and in sundry different spots of every town, the effluvia arising from filthily kept yards, of stables and hog-styes, of privies, and sometimes the breezes tainted by a dead cat, or, if without the suburbs, by carrion of larger kind, are offered to our sense of smelling, in doses of various degrees of intensity, and in every variety of combination. We become accustomed by the habit of endurance to these, as to all other evils, and in time, are scarcely conscious of the magnitude of the nuisance. But its offensiveness is estimated at the true value, by visiters fresh from the pure air of the country.

Now approaches the time when the Police, and the Board of Health will begin to bestir themselves to abate nuisances of this kind, but in such a way as to effect no manner of benefit. Their operations merely consist in moving decomposing matter, or its sources, from one spot to another, there to proceed as before—and by thus moving and dispersing filth, to hasten its decomposition still more, though rendering its products less evident, by their being more widely diffused. But the total amount of the production of such effluvia is not the less in quantity, nor the less hurtful, because, by being more wide-spread, and diluted, and by contaminating more of the atmosphere, the scent is less concentrated and offensive. All the operations of the most industrious and zealous Board of Health do not lessen the amount of decomposition within the limits of a town, unless the putrescent matter is actually thrown into and floated away by a rapid river, or otherwise conveyed away to poison the air some where else, where there may be fewer people to breathe of it. Every removal, and exposure of new surfaces, serves only to quicken the progress of decomposition.

It is not a little remarkable that this general state of filthiness is caused and maintained, in a great degree, by the fastidious or squeamish nicety of our people. It is almost universally considered that it is quite too dirty a business, too offensive to the imagination, as well as the senses, to use carrion and human excrement for manure. If this silly prejudice did not operate, and if proper economy were used to collect, preserve, and apply these rich and most decomposable substances, the profit which they would bring as manure, would far more than pay for the expense of the proper procedure to preserve the matters, and at the same time to maintain cleanliness. But it is not only that the contents of privies are suffered to accumulate, because of their being no profitable demand for them, (as exists in countries where the worth of manure is better understood,) but there is that want of accommodation in the number and situation of privies, which operates to the injury of comfort, of decency, and in many cases, directly as well as indirectly, to the injury of health. We are so exceedingly nice, or proud, that we desire to conceal the existence of such humiliating necessities of our nature; and no conveniences for the purpose are provided, and kept in proper order for public use: and the privation is a matter of extreme inconvenience to all decent visiters to a town, who have not acquired a knowledge of, and a right to use, some such places. The same morbid feeling of shame that prevents on the one side the accommodations being afforded, also prevents on the other any complaint of the want of them. But the ground for complaint does not the less exist—as every countryman can testify, and even every townsman, when visiting another town than his own. So nice and squeamish are our people on such subjects, that to treat of it by word or writing, would be considered by very many as both ridiculous and offensive; and when one ventures still farther, as I shall do, to recommend modes of removing the nuisance, and converting it to profit, there is much ground to expect that nothing will be excited, except a sense of the ridiculous in some, and a feeling of disgust in others. But I have never been deterred from urging what was deemed highly expedient, by the dread of being laughed at, and as to exciting disgust, it is just what is desired, provided it can be directed against the habits which are held up to condemnation.

In large cities, necessity has compelled the adoption of means to get rid of excrementitious and other filth, by a general system of sewers, or subterranean passages, into which all such matters are thrown, and by the flowing of water through, in abundance, they are washed into the adjacent river. The sewers of some great cities have been constructed on a plan so vast, and at so much expense, and were so excellent in their operation, that they have been considered as not less worthy of admiration than the magnificent temples and palaces. If the only object was to cleanse a town, and there was sufficient command of water, and of money, there could be nothing to object to this plan. Certainly the expense of constructing the sewers would be an objection not worth notice, when compared to the value of their intended effect. But if the system were not perfect, and the supply of water always abundant, the evil would be made so much the greater by being concealed from observation. There is another objection to this plan, in its contaminating and corrupting the waters of the rivers into which the sewers empty; and it may well be doubted whether water so defiled, does not itself throw off deleterious effluvia, and is not rendered more liable to cause decomposition in whatever decomposable matter it may reach; and thus that the waters are not only made to stink, but also to poison those who have destroy-

ed their purity. But the greatest objection to this plan, is the utter destruction of so enormous an amount of rich manure, which if properly preserved and applied, would soon make rich and fruitful the poorest surrounding country. And to properly accumulate and preserve all this manure, and prevent its being offensive to the senses, or injurious to health, might in most cases, (and certainly on all the eastern coast of the southern states,) be effected not only at less cost than by a proper system of sewers, but at less than the present wasteful and expensive system of employing laborers, under direction of the town police, and boards of health, so to stir up and move about the excrement, as to produce its most speedy decomposition, and total passing off into the air, and thereby to give the full benefit of its evolving effluvia to the nostrils of the towns-people.

The remedy is that which has been proposed in general terms in the preceding part of these observations; to provide *calcareous earth* (either marl, or whatever other form may be cheapest,) enough to cover every spot in the town, in which decomposable filth can accumulate; and this to be renewed from time to time, as needed. The calcareous matter would form a chemical compound with the putrescent, so as to preserve the latter from all waste, and from giving out any offensive odor; and once a year, (when in situations not convenient at all times,) and in cold weather, the accumulations might be removed to the country to be used as manure; and the richest as well as the most permanent manure in the world, this compound of animal and calcareous matter would be.

The object would be to *accumulate*, as much as possible, instead of *dispersing*, the most putrescent matters. And for this purpose, as well as to afford the general accommodations now so much required for comfort and for decency, and also for health, there should be large and well constructed privies erected in suitable situations, and at convenient distances apart, throughout the town, free for the use of all males without exception. The pits should be large and sufficiently deep, but accessible to carts, to bring marl, and to remove the contents. At the expense of the town (as the whole system ought to be,) there should always be kept a heap of rich marl near to each pit, and a sprinkling, once or twice a day over the excrement, would effectually secure it from wasting, or being offensive. By such places of accommodation being furnished, and kept in the neatest condition by regular attendants, there might be, and would be abated many of the small private receptacles, which necessarily (as now managed) are more or less filthy nuisances. And the *buckets* which now are at night emptied on all vacant and forbidden spots, (and requiring the unceasing activity of the Police and Board of Health to attempt to prevent.) would be then emptied into these pits, with certainty, simply because they would offer the nearest and most convenient places of deposite. There would then be no inducement remaining for the defiling of every spot of vacant ground; and such places, instead of being abominations to the senses and the minds of all decent observers—and absolutely forbidden to the footsteps, and even to the distant view of modest women—would be clean and lovely grass plots, serving to refresh and relieve the eyes tired of seeing brick walls and stone pavements. I will touch but gently on the *moral* nuisance that exists in so many cases in every town, where these vacant spots, the only public places "of ease," are overlooked by the back windows of the houses of respectable families, the members of which, though at considerable distances, are nevertheless unavoidably subjected to witness indecent exposures, still more offensive to the mind than to the eye.

In addition to the public and general accommodations proposed, there should be a certain and sufficient quantity of marl carried at certain intervals of time, to every private lot, (unless the occupant took measures to provide himself with it,) to be used as wanted, for similar purposes. This would prevent, what is almost impossible now to avoid, there being offensive accumulations, or still more offensive removals and dispersions, of fœcal matter on private lots.

It would be impossible to approach the truth in estimating what would be the expense of such a system in any particular town, until it shall have been tried. But there can be no doubt but that the benefits would far overbalance the cost. Many expenses and evils, much worse to bear, and now continually encountered, would be, by these means, avoided. Such of these as bear on private individuals, I pass over without notice. For one item, the public would save all that part of the labors of their police, which is now most unprofitably devoted to this object.

But even if it is admitted that the means proposed would be as effectual as I imagine, in preserving cleanliness, and cutting off sources of disease—and that the compound formed is of all the supposed value as manure, still it may be objected that it would be long before prejudice and incredulity will be so removed as to make this manure an article of sale—and consequently, that all expectations of returns from sales must be visionary. Even if there should be no sales for two or three years, and if the manure should be merely taken for the trouble of carrying it away, the expense would be well afforded as a mere matter of police. But two years' use would make manifest the value of this compound manure, and the demand and the price would afterwards gradually increase, until it would nearly or quite defray the whole expense of the plan.

But the town of Petersburg has at once the best possible customer for all that the plan would supply for some years, in the farm of the Poor-House, belonging to, and cultivated at the expense of the town. To this land, now, much putrescent manure is carried, removed by the Police from the town. But except in winter, or at the rare and short other periods when manure can be (or is) at once advantageously laid on the field, these supplies are heaped up for future use, and of course, rot away as rapidly as possible, and give ten times as much of their products to the air as to the soil. Besides—even if there was not necessarily this great waste from the decomposition of manure altogether putrescent, when moved and heaped in warm weather, there would be very little profit from its application. The lands lying over the belt of granite which passes through Virginia, and which forms the falls of the rivers flowing to the Atlantic, are, naturally, among the most destitute of lime, and consequently are among the poorest and the least capable of retaining putrescent manures when applied to them. Such are the lands surrounding and within a few miles of

Richmond and Petersburg, and probably all the other towns at the falls of our rivers. Particular individuals, by lavish use of the cheap and rich manure of the public stables, have highly, though but for a short time, improved some of these lands, and reaped heavy crops, and, possibly, made great profits. But still the demand for such manure by the hungry, yet wasteful soil, is continual, and if it is not frequently repeated, the original poverty soon returns. But few persons have used these means, to much extent, and most neighboring residents are satisfied that the town manure is too costly to be carted to their farms. Yet though the richest stable manure, (richest because it is principally of animal matter,) may be bought from the tavern and livery stables at 12½ cents for the largest single horse loads' (20 to 25 bushels,) it mostly rots away in bulks in the stable yards, for want of regular purchasers even at that low price. So it is however—from the little town manure carried to neighboring farms, the little permanency of effect of what is used, and the general impression that it is not worth using—it results that most of the lands, lying even within the short distance of a mile from the towns, are wretchedly poor, and yield but little for the support of the town, either in grain, grass, or garden vegetables for market. Indeed it may well be doubted, whether a large proportion of the population of the vicinity do not buy (or obtain otherwise) from the town, as much provision as they sell to it. This state of things has continued, with but little actual improvement, as long as these towns have stood; and it may safely be predicted, that unless calcareous manures are used to fix the otherwise fleeting value of the putrescent matters, that the general condition of things will never be much better. It is not then strange, that with the neighboring farms so poverty-stricken, the town markets should be badly supplied, and at high prices, with all the small articles of daily purchase and consumption, which, though small, make up the greater part of the comfort, and (at usual prices) cause the greater part of the expense of living. Just let the reader imagine what would be the difference in these respects, if the lands surrounding each town, for as much as six miles distance, were as rich as they well could be, and produced in abundance, clover and other grasses, a full supply of garden vegetables and other small articles for the daily markets, besides their large crops of grain and other staple products. The comforts of all the persons living in town, so far as they depend on food, would be greatly increased, while the expenses of living would be made less than at present—and yet the suppliers of the market would be better rewarded than by the present miserable system, because rich land and good farming can always undersell the poor and unproductive; and a market generally well supplied is a more sure, and therefore a better place of sale, than where demand is irregular and, of course, prices irregular, though often very high. It will be under such a state of improvement that market gardens and market farms will be profitably kept—and the towns will be abundantly supplied, and from their neighborhood, with milk, cream, butter, eggs, fowls, and fresh meats of fat young animals, as well as with vegetables. The surplus product of hay, grain, and other field crops, of such highly enriched districts, would make no small addition to the sales and the export trade of the towns, and would serve to increase their population, and thus furnish a still increased demand for the products of the neighboring lands. It is also probable, that if the fish, of the rivers which flow by towns, were not driven away by the filthiness of the water, that their numbers would be the greater on account of the neighborhood of a town, (and the abundance of food thrown into the water,) instead of being reduced almost to nothing, as is notoriously the case. Even the shad, and other fish of passage, whose instinct strongly impels them to seek the higher waters of rivers, to deposite their spawn, are mostly deterred from passing through the flood of filthy water that a town supplies; and the people on the upper waters suffer thereby a privation, as do the townsmen by the driving to a distance the more fixed residents of our fresh water rivers.

It may however be reasonably objected, by those who have not studied the qualities of soils and manures, that too much value is counted on from the use of this proposed compound matter. It would be unnecessary here to repeat at length all the grounds on which that estimate is founded. For the amount of early and annual increase to be expected from marl on naturally poor soils, and for the permanency of its effects, I refer to the reasoning and the facts presented in the *Essay on Calcareous Manures*, and also to the opinions of the hundreds of farmers in lower Virginia who are now thus improving their lands. For the chemical power of calcareous earth in combining with, and preserving from waste, putrescent matters, I refer to the general reasoning on this head in the Essay, and the statements made in the first of these communications. As to the enriching value of human excrements, it is known, in Europe and in China, that they are the richest of all. In England, it is stated in agricultural books, that two wagon loads is a sufficient dressing for an acre—probably because more at once would be hurtful to the crop. In France, there are in operation regular establishments set up by private adventurers, for *desiccating*, and thus preparing for use, the products of the privies and public sewers of large cities; and sufficient profits are made to support these establishments, by selling the dried manure *(poudrette)* to the farmers. Its great richness, in small weight and bulk, makes it well suited for distant transportation, and extensive sale. From the accounts that I have read of these establishments, it may be inferred that much previous decomposition, waste of value, and extrication of offensive effluvia, must take place in the material, before it is brought to the desiccating establishment—and that both the previous and subsequent manual operations must be highly disagreeable and disgusting. Besides, the desiccation seems to be sought more by mechanical than by chemical means—and any dry pulverized earthy matter is used to absorb the fluid and to make the mixture dry. There does not seem to be much choice in the earthy substances. Thus they propose gypsum, and burnt earth, and quicklime, as well as chalk, rubbish of demolished buildings, and coal and wood ashes. The first two of these substances, according to my views, would be but of little effect, acting as they do only mechanically; the quicklime, (which it seems is preferred,) would be decidedly injurious; and the mild calcareous character of the latter substances would render them, only, proper for

the desired results. The profit of this business in France, alone, would be sufficient proof of the greater value of the far more simple, economical and effectual and cleanly plan which I recommend, and which is also perfectly in accordance with the chemical properties and action of the substances used in the compound. I annex the only known description of the French process, below, in the application for a patent by the inventor, Donat, and which was communicated, with the introductory comments, by the Board of Health of Philadelphia, to the Agricultural Society of Pennsylvania.

French method of preparing poudrette and urate for manure.

'*To the Pennsylvania Agricultural Society.*

'The attention of the Philadelphia Board of Health has been earnestly directed towards discovering some mode of disposing of the contents of privies, which would remove from the precincts of our city, where the deposites are made, a nuisance at present of a very formidable character, and which must necessarily increase. In pursuance of this object, the board has concluded, that an effectual remedy for the evil is only to be sought in the conversion of the offensive substance into *inodorous manures*, after the methods now successfully practised in many parts of Europe, and especially in the cities of Paris and London.

'The principle by which this object is effected, is simple, and consists in the drying, or desiccation of the urinary and fœcal matters, either apart or together, by the addition of certain absorbent substances, such as plaister, lime, chalk, ashes, &c. It is probable that the ashes of the Lehigh and Schuylkill coal may be thus usefully disposed of. The manure prepared from the fœcal or more solid contents of privies, has long been known and highly esteemed by the gardeners and agriculturalists of France, under the name of *poudrette*. That prepared from the urinous portion is comparatively of modern invention, and is called *urate*.

'Aware that such a plan is not to be carried into effect under the special direction of either your society or their own body, the board lays the subject before you, in the hope that its advantages will be properly investigated and made known, so as to lead to useful results; for, surely, nothing can be more worthy of general and special encouragement, than a plan not only calculated to promote the health and comfort of our large community, but to render essential assistance to the most important of the useful arts, insuring at the same time liberal profits to those actually engaged in its execution.

'That your society may be placed in possession of more particular information relative to the subject under consideration, the board would refer you to numerous highly favorable reports and interesting proceedings of the most respectable associations established in Europe for the encouragement of agricultural and useful arts, among which we would especially call your attention to those of the French "Royal and Central Agricultural Society," and the "Society for the Encouragement of National Industry," during the years 1818–19–20.

'The following translation of a French document, furnishes an accurate detail of the process by which the *urate* is manufactured, and throws much important light upon the subject generally :

"Certificate granted upon the application for a brevet [patent] of invention, to M. Donat, (Joseph Etienne-Victor-Gabriel,) residing at Paris, department of the Seine.

"The Ministerial Secretary of the state, for the department of the interior, considering the Memoir of M. Donat, proprietory, residing in Paris, Rue des Bons-Enfans, No. 28, in which he states his desire to enjoy the proper rights secured by the law of the 7th of January, 1791, to the authors of inventions and discoveries in all kinds of industry, and to obtain in consequence, a brevet of invention for fifteen years, for the sudden drying of the urinary portion, and manipulation of the contents of privies, within the twenty four hours succeeding their removal; all by particular means and processes, of which he declares himself the author, as it appears from the verbal process addressed at the time, to the depot of documents attached to the secretaryship of the department of the Seine, the 19th of January, 1819.

"Considering the designs of the apparatus, and the descriptive memoir of which the following is a copy.

"I have contrived a plan which affords me the means of extracting from urinary and fœcal matters, a manure very superior to those hitherto known. Desirous of securing to myself the exclusive enjoyment of my invention, I have made application to the prefecture, department of the Seine, conformably to the laws of the 7th of January and 25th of May, 1791, for a brevet of 15 years, for the complete and immediate desiccation of fœcal and urinary matters together, or separately, by means of absorbents which I add, such as lime, plaister, chalk, marl, ashes either natural or mineral, such as are taken from the different ash mines. Substances having calcareous bases may be calcined for the absorption of a greater quantity of liquid, at least when the high price of the combustible, or the low price of the absorbent, do not offer greater advantages in using it directly from the quarry.

"This variety of absorbent substances, assures to every country the means of manufacturing a very abundant and active manure with human dejections. The product of my operations is inodorous, for two reasons: The first is, that when urine is employed, it gives out no odor after the absorption of its moisture: The second is, when the fœcal matters are sufficiently mixed with the absorbent, I bury them at least 18 inches deep, to prevent the disengagement of the odor during the fermentation necessary to the good quality of the manure.

"I give to the manure made with pure urine and one of the aforesaid substances, the name of *urate*. I believe that this composition, mixed or combined with that resulting from the combination of fœcal matters with a certain quantity of one of the aforesaid absorbent matters, produces a manure of great activity. The only difficult point is, to ascertain the proper proportions for the admixture.

"For the manufacture of the urate on a large scale, it is necessary to construct at least six basins, in form of a watch glass, inverted. They should hold about 12 hectolitres, (about 300 gallons,) of which there will be six of urine and six of the absorbent matter of one of the kinds formerly designated, freshly calcined.

"The cask or vessel holding the urine, is to be so placed that it will empty itself through its bung into the basin. During this operation, one workman is employed in pouring in the plaister, another in mixing it in the basin with a rake or scraper.

"When the mixture is finished, the operators pass to another, and so on to the sixth. Then the first is emptied for the purpose of commencing operations anew. The mixture is finished by further drying in the air.

"At the end of the day, the quantity of urate which has been made since morning, is to be broken down by means of a cast iron cylinder rolled over it; after which it is sifted, *(passée à la double claie,)* and then immediately stored or packed up, to prevent the absorption of moisture.

"By this combination, the urine being dried by its union with the absorbent matter, which is itself a manure, unites all the vegetative powers of its two component parts, and will constitute the most productive of all our manures, in consequence of the very small quantity that is necessary to employ to procure the best results.

"I have designated six substances as being proper to absorb the superabundant water of urine, and I have only mentioned them without pointing out any particular one, as I thought that no country is without some one of them. But in case I am mistaken in this opinion, very great advantages may still be derived from urines, by mixing them with burnt earth, (that of heath soil is to be preferred,) or with natural ashes, *(cendres naturelles.)* I only estimate the value of this mixture as a means of obtaining all the salts of urine in a solid state, which will facilitate its transportation and employment in agriculture.

"The ancients considered urine as the most powerful of manures. This is not therefore the end of my invention, which consists alone in its sudden desiccation and solidification, and the draining or drying up of those infectious depositories of this substance to be met with in the environs of large cities, where they furnish inexhaustible sources of unhealthy exhalations.

"I leave it to the learned societies to express their judgment upon the qualities of the urate, and restrict myself to the application for a brevet of invention, for a method of preparing it immediately, so as to destroy at the same time the odor of the urine.

(Signed) DONAT.

"*Paris, January 19th*, 1819."

'[Here follows the certificate granting the brevet or patent to M. Donat, for 15 years, signed by the Ministerial Secretary of the interior department, Count Decazes.]

'Signed for and on behalf of the board of health.

SAMUEL J. ROBBINS.
President.'

Attest,
THOS. H. RITCHIE, SEC.
Philadelphia, January 16th, 1826.'

However beneficial may be this plan, both for cleansing a city and for forming rich manure, it is evident that the process is not conducted upon uniform, and rarely upon correct principles—which I consider are only conformed to when the absorbing matter used is some form of *mild* calcareous earth. By calcining this material, as the inventor recommends, a destructive, instead of a preserving ingredient is formed—and one which never should be used to mix with fœcal or other animal matter, if the value of the product, as manure, is of any account. Far better than this French method is that which has been in use time out of mind among the Chinese—a people, who however unenlightened in science, are in advance of most other nations in the means for preserving and increasing the fertility of the earth. Travellers have informed us, that in that country, human excrements are mixed with clay marl (doubtless rich in calcareous earth). The mixture is made up in the form of cakes, which after being dried, are free from all offensive odor, and indeed give to the senses no indication of their composition; and they are exposed in quantity in the streets for sale, as manure for the neighboring lands.

There is an obvious objection to, or ground to doubt, the effects imputed to decomposing filth as causing disease, in this well known fact, that in spite of this and all other sources of disease, our towns are more free from autumnal sickness, (the effects of *malaria*,) than much of the neighboring and surrounding country; and that the towns have all become more healthy, as they have increased in age and population. These general facts are admitted to be correct, but the inference from them is denied, on the following grounds.

In the first place—bad as may be the effects of the gaseous or aeriform products of animal putrefaction, it is well known that they are much less productive of malaria than are those of vegetable putrefaction. This I believe is a well established and universally received medical fact. And as our *police of health* in the country is at least as bad as in the towns, (though the nuisances are of a different character,) it may well happen, that the vast quantity of decomposing vegetable matter in the woods and in the fields, where there is no calcareous ingredient in the soil to combine with the products of decomposition, and to fix them there—together with the pestilential effluvia from the numerous mill ponds, which more or less affect injuriously half the places of residence in lower and middle Virginia—may produce more malaria and disease, than the decomposition of animal filth in the towns. Besides, there are counteracting agencies always operating to lessen the ill effects of decomposition of filth in towns, though such operation is neither intended, nor understood, by those who profit by it. From various sources, the calcareous earth in towns is always accumulating. The ashes of all the wood consumed as fuel, furnish a large and rich supply—and though these are sometimes conveyed away for manure, still the far greater part is scattered about the town. Coal ashes, in a much less degree as to strength, also add to the stock. The waste of lime, and the old cement of buildings repaired or demolished, all furnish calcareous matter, and all, though without its being designed, are in time spread every where. But the burning of a town, or a large portion of it, as stated in the first part of these papers, furnishes the great supply of calcareous matter—enough indeed to give a very heavy dressing to the whole space burnt over, and much more—and to serve to combine with all the animal matter for a number of years, and to give permanently to the soil of the town, that valuable quality which is entirely wanting in that of the surrounding poor country.

There is one still more foul abomination in our present system, which has grown out of the want of proper public accommodations, and the extreme difficulty (not to say indecency) of daily removals of uncombined and unchanged excrements from private houses. The practice alluded to belongs to the most crowded parts of cities, and has proceeded from them, and from Europe, to this country, where as yet it is but little used. Where space is very costly, deep pits are dug beneath privies, from which the contents are not removed for years together, and more probably *never*. They do not become *full* (or at least very slowly,) and thereby *compel* their being emptied—because after a certain bulk of the highly putrescent matter has been accumulated, the waste by decomposition goes on nearly or quite as fast as the increase from the daily additions of material. If quicklime is added, this decomposition is hastened, and a different, though but little less offensive odor is substituted. But whether these depositories are cleaned out at long intervals, or not, there can be no question but that nineteen-twentieths of the whole mass goes off by decomposition, and is mixed with the atmosphere; and however diluted, or however altered by mixture, helps to form the air breathed by the inhabitants of towns—who are too delicate, and too fastidious, to have all such nuisances prevented by proper, general, and public regulations. We have not yet been enough crowded in our towns for the last mentioned prac-

tice to have gone to much extent. But as it is the result of (supposed) necessity, it will increase with the growth of the towns; and as such receptacles will be of course concealed as much as possible from observation, their existence will not be known, nor the extent of the evil estimated, and scarcely even suspected.

In France, in past times, when there was neither the refinement of manners, nor the knowledge of the evils produced, that now would forbid the introduction of such a usage, large and deep covered pits, or vaults, to privies, were common in the smaller towns, and which were by no means kept for private use. In such public places *(fosses d'aisance)* the rapid accumulation made it absolutely necessary to remove the matter sometimes, though very rarely; and a description of the state of things at such times, and the effects produced, on health, and even life, and the necessity of guarding against them, will serve to show to our citizens, who have never thought of any evils except that of offensiveness to the senses and to decency, that effluvia, always hurtful and sometimes deadly in effect, are actually evolved. And it should be borne in mind, that the same effluvia must be extricated from smaller accumulations also, though the effects are diminished according to the smaller amount and more gradual extrication, or more diluted state of the doses inhaled by the surrounding population.

There is another and still more disgusting, and still more evident effect of accumulations of putrescent animal matters in towns, presented in the infiltration of the fluid parts through pervious strata of earth, and the consequent admixture with the water supplying springs and wells. This part of the subject may be resumed, and treated more at length in a future number of these observations, so as not now to interrupt the consideration of the effects of gaseous or aeriform products of accumulations of putrefying animal matters.

No. III.

The police of filth, in towns, continued. Facts and opinions on the subject from French authorities.

The following article, which I have translated from Rozier's "*Cours Complet d'Agriculture*," *etc.* (Paris edition, of 1815,) will serve to present in a stronger point of view the dangers to health caused by accumulations of fœcal matters in towns. The reader may be instructed by its facts and reasoning, as to the importance of the subject to health—and he will also be amused by the display of technical terms, and form of scientific arrangement and classification, applied to such a subject. But this manner of the French author, nevertheless, furnishes additional evidence that the subject has been long studied in his country, and therefore, that the results obtained, and the opinions derived, are the more entitled to respect.

It is proper to premise, that in France, and elsewhere in Europe, the poorer cultivators and inhabitants of the country do not generally have separate and isolated dwellings, as in the United States, but are collected in villages, or hamlets, which are surrounded by the fields which the inhabitants cultivate, and the pastures on which their cattle graze. This state of things, which was originally required for mutual security, and which old habits still retain in use, has no existence in the United States, except among some cultivators of French descent, on the Mississippi, and the laborers in cotton or other large factories. It is to villages, and perhaps crowded villages, that the author refers, in the following piece, when speaking of the "*country;*" and the "*fosses d'aisance*" of which he treats were common to the use of many persons. The injurious effects described, like the circumstances which produced them, are also (as yet) without parallel in this country. But we have no right thence to suppose that our different habits lead to no danger, or to much less evil than the deep and large vaulted "*fosses d'aisance.*" In the latter, as described in the French account, the accumulation of fœcal matter, and the concentration of the energy of its poisonous products, serve to exhibit its worst virulence bearing upon a small space, and upon the very few persons most exposed by nearness, or actual contact. But if the matter was diffused, as by the practices and habits of our population. the same kind of fermentation would proceed, the same products be exhaled, and as much deadly aeriform poison be evolved and breathed, but rendered scarcely sensible in effect, by being widely diffused over much space, greatly diluted, and thus divided among a much greater number of persons.

[*Translation.*]

Fosse d'Aisance. This subject relates directly to agriculture, as furnishing one of the most excellent manures, at the same time that it interests the health, and even the life of the cultivator; for, how many casualties occur in the country [villages] by the emptying of these pits, for want of knowing the means of preventing them!

We shall not speak of their construction, which makes an essential part of the art of building; but we are going to enter upon some details in regard to the various substances which compose the matter, or contents, of the pits. We have not to fear exciting the *disgust* of the cultivator; accustomed as he is to excrementitious matters, he will consent that we shall instruct him concerning that of which he is less informed.

These substances are distinguished by the names of the *crust, (croute) hècate, vanne,* and *scrapings (gratin).* The *crust* has often sufficient thickness and firmness to sustain the weight of the laborers walking on its surface! The *hècate* is the pyramidal heaps. The *vanne,* is the liquid part, usually of a green color, and is corrupted *(infecte).* The *scrapings* are the parts adhering to the walls, and to the bottom of the pit.

The crust is sometimes pushed up (from the mass below) by a sufficiently voluminous layer of mephitic gas, so as to induce the belief that the pit is full. In this case, the emptying of the pit may be put off to a future time, by merely opening into, and facilitating the escape of the intermediary layer of gas, and thereby lowering the crust.

We proceed now to the accidents occasioned by the emptying, and often even by the mere opening of a (covered) pit. Frequent as such accidents are in the cities, they are much more so in the country [villages,] in consequence of the little experience of this operation. The two only means of preventing them are quicklime and fire.

This article, in Rozier, occupies much extent,* and contains a *Memoire sur les Fosses d' Aisance*, which I had prepared when I was engaged in investigating the subject, in concert with Laborie and M. Parmentier. The employment of quicklime consists in slaking it to put it in a state of powder, or to make a fluid by mixing it with very little water, and to introduce it into the contents of the pit, by stirring it with a pole; then the mephitic exhalations are destroyed or confined. The proportion of lime required, depends on the mass of matters, and the cessation of the existence of mephitic gas, of which we may be assured by letting down a lighted candle to the surface. If the flame is extinguished, or even burns dimly, there is still mephitic air undecomposed, and more quicklime is to be added.

As to fire, there are many modes of applying it. Either a chafing-dish of burning coals is placed in the pit, and left there to burn out completely, or dry straw is lighted on it. It is useful to make (in the walls) air holes; they may serve for the escape of the lightest gases; but how little do they draw, when the atmosphere weighs on their orifices! For it is of the *fosse d'aisance* as of the barometer—or rather it is one of the most faithful of barometers. The weather will continue clear, as long as, from the holes over the pit, there arises *ammonia*, that purgent odor so sensible to the eyes, and to the smell.

The crust is sometimes firm enough, I have said, for the workman, without inconvenience, to walk upon its surface. This surface is commonly covered with sulphur, as is also often the vault (or arched covering) of the pit to which the sulphur sublimes, and fixes on. Sulphur is a very abundant product of the fermentation of animal substances; under these circumstances it is formed in the humid mode. When charged with the excavation of the half-moon of the gate of Saint-Antoine, which, from a very remote period, had been made a common receptacle of filth, *(voirie,)* I was struck with the enormous quantity of sulphur with which the earth was impregnated. It is to this sulphur, or rather to the sulphuretted hydrogen gas, which is formed in the pits, and is the most mephitic of known gases, that are principally owing the accidents produced by the operation of emptying these receptacles. M. Dupuytrein has thrown much light upon the different gases held by the matter of the *fosses d'aisance*. At the time when I was occupied in this investigation, Lavoisier, the Abbè Fontanes, whom I had invited to repeat or examine the experiments, could not pronounce upon the diversity of emanating gases; of which one kind, the *mitte*, [as vulgarly termed,] which limits its effects to causing to the workman a momentary blindness, seeming to affect merely the system of optic nerves—whilst the other occasions the painter's colic, and conducts its victim to the state of paralysis, to asphyxia, and finally to death. The experiments of M. Dupuytrein, though interesting in their relation to science, have changed nothing in the preservative means which we have stated, to wit, quicklime and fire, as the destructive or ventilating agents. It is to the negligence of these means, I repeat, to which is to be attributed the accidents that occur from time to time.

Lime is the most energetic disinfecting agent. Throw it into the putrid fluid *(vanne)* of a *fosse*, and it becomes instantly inodorous; it fixes, *(enchaine,)* it decomposes all the mephitic gases. It is thus, that when thrown into a *fosse*, it suspends the extrication of infectious emanations, at the same time that it arrests the tumescence and fermentation of the matter, which is lowered, and the space of time before the emptying becomes absolutely necessary, is thereby prolonged. It is recommended by many to throw snow into the pits, on the pretence of its economizing the emptying, because, as it is said, the snow consumes the excrementitious matter. If the soil in which a pit is sunk is so pervious as to permit the infiltration of the liquid portion of its contents, then the adding of snow (that is, water,) by giving more fluidity, will facilitate the imbibing by the soil. But if the pit is well and solidly constructed, and loses nothing by filtration, the addition of snow does but augment the mass, and hasten the time of emptying. It is thus that people assert every thing, because they believe every thing—and ignorance loves best that which is the most improbable.

There is a phenomenon which it is suitable to mention in this article, as sometimes causing accidents. It often happens that children throw lighted papers down through the orifices of the seats over the *fosses*. When our *barometer-fosse*, in place of ammonia, exhales sulphuretted hydroden, this gas, the most combustible of all, takes fire, with explosion; and if a sufficient quantity of sulphur is formed upon the crust, or upon the arched roof, the bursting of the roof of the pit may be the result. This gas of *fosses* is also met with in mines, and takes fire there from the lamps of the workmen. But in the mines, the explosion is seldom attended with injury, because there is communication by galleries, or by the ceiling, with the atmosphere: the workman throws himself flat on the floor, and it is as much if his hair is singed by the meteor-like fire, which burns but little, and very rapidly.

But why should *fosses* be permitted to exist, when their contents occasion so many accidents? Their cleaning out is the profession the most abject and most disgusting; and it is difficult to conceive how men can devote themselves to it voluntarily. Certainly, humanity would not permit that a legislator should inscribe such a punishment on the penal code. The workman employed in this wretched business, raises the stone that serves to close the entrance to the vault, and often there immediately exhales a *mofette*, or gas, dangerous or mortal. Another *mofette* is found under the crust into which he cuts, which escapes at the first stroke of the hoe. He puts down his ladder, and descends into this gulf; he makes the reign of the cross, asking the protection of Heaven. He draws out the putrid fluid; at the end of some minutes, it is the *mitte** which reaches him; he is struck with blindness; he is drawn out, if not blind, at least deprived of sight for more or less time. Or perhaps it is the *plomb*;* his knees fail, he staggers, and has a universal

* It is the writer of this article, Cadet de Vaux, who speaks, and probably in reference to the previous edition of Rozier's *Cours Complet*.—Ed. Far. Reg.

*These are provincial names given to the different exhalations, (or *mofettes,*) as distinguished by their different poisonous effects on these exposed to their greatest power.—Ed.

trembling; cold siezes him, he breathes with difficulty, and he is conducted to the hospital to await the coming of convulsions, violent colic, and other pains, and paralysis which often becomes permanent. Another workmen succeeds the first; he has a rope fastened aronnd his breast and beneath his arms, while the other end is held by one of his comrades above, who follows him with his eye, and is ready to draw him up, if he plunges into the *vanne*, or falls extended upon the more solid mass, struck by asphyxia, (fainting) if not by death. It was doubtless, the existence of *fosses d'aisance* among the Greeks, which has furnished grounds for the fable of the mouths of Styx and of Cocytus. The noted Grotto del Cane (of Italy,) does nothing but produce asphyxia—that is to deprive of the signs of life, which are restored immediately by the subject being plunged in the water of the neighboring lake, Agnano. But it is not the same with the asphyxia occasioned by the emptying of *fosses d'aisance*. The sulphuretted hydrogen gas is quite another thing to the carbonic acid gas.

The numerous accidents occasioned by the emptying of *fosses d'aisance* were among the first objects which exercised my zeal in the career of public utility to which I have consecrated my labors. In consequence, I enlisted the solicitude of government, and proposed to it to unite myself with Laborie and M. Parmentier, for continuing the researches which were alike interesting to humanity, to science, and to agriculture. Chemistry had analyzed the excrementitious matters; it had commenced to analyze the gases; but it had not penetrated into the interior of the *fosses d'aisance*, the only laboratory in which to examine the phenomena which the most putrescent substance presents. From these researches, it has resulted, that no workman who will take the precaution which we have proposed in the use of quicklime, and of fire, ought to perish in cleaning out *fosses* or wells; or in the excavation of mephitic soils, to which I have applied, with no less efficacy, these cautionary means against death and asphyxia.

Soft stone (*pierre tendre*) should be used for the construction of *fosses d'aisance*; hard stone has not sufficient resistance. The gases the most active, the most solvent, exhaling from the excrementious matters which are undergoing an uninterupted process of fermentation, tend to soften the stone, which they penetrate to a great thickness. I have seen walls of extreme solidity, of which the surface might be crumbled by the fingers—not only the wall of the *fosses*, but those of the body of the [upper] building forming the privies; whilst the soft stone permits the penetration of the viscous fluid, which thus forms a coating that prevents infiltration.

The circular form is so much the more necssary, as I have seen [square] *fosses* of which the cleaning caused no accidents to the moment when, the centre being emptied, the corners were commenced upon. Nothing is more dangerous than to meet with bunches of straw or hay, which have been thrown into the pit; it is rare that they do not conceal a *mofette*, or mephitic gas. In general, all foreign substances add much to the dangers of emptying; it is thus that soap waters [which have been used for washing,] may cause a *fosse* to be fatal to the workmen engaged in emptying it.

* * * * *

I will observe that pits for farm-yard dung, ought to be considered as true *fosses d'aisance*, in regard to their putrid fluid part, the mephitic gas which they evolve, and consequently, of the accidents, which are of similar character, which attend the emptying of *fosses* of farm-yard dung; so that the means indicated as safeguards in the one case, suit also for the other.

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No. IV.

The waste and destruction of town-made stable manure, and of other rich materials.

The almost universal mismanagement of the manure made in tavern and livery stables, where many horses are usually kept, and the gross ignorance or total disregard of the principles, shown in every particular, are still more strange, and less excusable, than any of the errors and neglects in the matter treated in the last two numbers. In regard to that, it must be confessed that there is much to excite prejudice and disgust—and therefore, there are strong objections to economizing the value and applying it to proper use. But in regard to the manure furnished by domestic animals, no such objections exist; and no owner of a stable, or cultivator of a farm, has any doubt, (even when there ought to be doubt,) of the manure obtained from horses, (more especially,) being rich, and beneficial in use. Yet, notwithstanding this opinion, the nearly pure animal manure of stables, in Richmond, (where all manures are more in demand for reason of their being more market farms) sells, for 25 cents the cart load (of 20 heaped bushels)—and in Petersburg, at half that price the sale has been always slow, until very recently. Even at these low prices, the buyer sometimes complains of paying too much—and with truth, inasmuch as the half of the bulk, and nine-tenths of the strength of the manure, are destroyed before the small remainder of value is applied to his field.

The dung and urine of corn-fed horses make a manure so rich, and therefore so inclined to run into violent and destructive fermentation, that it is very difficult to avoid great loss of value from that result, even in cool weather, and when there is mixed with the animal matter ten times its quantity of vegetable matter, used for littering the stalls. Few farmers, of even the careful and judicious, who put stable manure in heaps, escape some loss from destructive, *consuming* fermentation, which produces the "*fire fanging*," whose presence is so plainly marked by *white mouldiness*. When the fermentation is very violent, from too little moisture, and this *fire-fang* is dry, and found throughout the whole mass; then nearly all the rich parts of the bulk have been already decomposed and driven off in gases—and the mouldy and scorched bulk left, though still deemed rich, because it is *stable manure*, is perhaps dear at the usual miserable price of about half a cent the bushel.

Straw, the usual material for litter, or any other kind of litter for stables, is a costly article of purchase in towns; and under the present bad system, this dearness must continue, as even the carriage, from the places of supply in the country, must make the article costly. The owners of public stables cannot afford to pay the prices for litter which the present scanty demand would make ne-

cessary to be asked by the seller, so long as there is no better price offered for the manure that is made. Still less, under the existing circumstances and present opinions, can the owners of private stables, or persons who keep only one or two horses, or cows, in the town, afford to pay for a sufficiency of litter—as their trouble and cost would be greater, and their sales of manure less profitable, than of the large stable owner—because every small business is less profitable than large operations. Therefore it is in vain to expect a change from the owners of town stables, unless it is made their interest, by the owners of neighboring farms presenting a sufficient demand for the manure, in its recent and most valuable condition. Therefore, while so little country demand exists for the manure—and while travellers and other horse owners will submit to the present abuse of the animals in stables—there will be no beneficial change in the management. I shall hereafter propose advantageous means for supplying the deficiency of litter; but at present, shall continue the consideration of matters as they now are.

According then to the present system of stable management—if it were not for the bad quality of the hay, which causes much of it to be pulled out of the racks without being eaten, and thus to be trodden under—the horses in most public stables would have nothing beneath their feet when standing, or their bodies, when excessive fatigue absolutely compels them to lie down, except the earth, wet and saturated, if not actually made miry, by their urine.

The rack is kept filled with hay, and the horse perhaps receives a very full allowance of grain. But a dry and clean bed to stand and to lie on, with half as much corn, and a fourth as much of *good hay*, would probably keep the animal in more comfort, and as good health and flesh—while the materials for manure, or the product in the stable, would be increased ten-fold.

The urine of animals, considering the very large proportion it makes of their excretions, is litinferior in value, as manure, to the more solid part; and this is lost, on an earthen floor, not well covered by absorbing litter. It merely serves to make the floor filthy, and very uncomfortable, if not absolutely injurious to the health of the horses. When a plank floor is used, the horse is at least kept out of the mire—but the urine leaking through the planks, settles into the earth below, and is there continually decomposing, and throwing up ammonia, and other gases. A *better plan* than either of these is seen in one of the livery stables in Richmond. It has a plank floor, and Shockoe creek passes under the house—and by a few auger holes in every stall, all the fluid, semi-fluid, and much of the solid matter, are gotten rid of with less trouble than by the usual modes, though not more effectually—and the horses at least are free from the inconvenience of standing in filth.

But as every stable owner has not the convenience of a creek to receive the richest parts of his manure, let us proceed to consider the more usual modes. The stable is cleaned out every morning, by sweeping up the dung, and the little wet hay (or other litter if any,) mixed with it, and carrying it in wheelbarrows to be thrown on a *heap* in the yard. The mud formed by the urine with the earthen floor, is swept over very lightly, lest any of it should be removed. Of course, so far as the end aimed at is attained, the urine is all lost to the manure; but acts, in decomposing, to do all the harm it is capable of in exhaling gases. What may be that amount of harm, under these circumstances, or whether there is any produced, I do not pretend to say. It is enough that, as manure, the urine is totally lost. The richness of the materials of the heap, and its want of continued and sufficient moisture, induce speedy, rapid and violent fermentation, which is soon destructive of all the richest and most soluble parts of the vegetable as well as the animal ingredients; and this fermentation continues as long as there is enough remaining moisture to support it. The slow and gradual additions to the manure heap, made every day, just serve to maintain a continual and fierce heat. These daily supplies of new materials are like fuel added to fire. The residuum, after this scorching operation, is the stable manure that is usually applied to the soil. It may be true that the destructive process is not often so effectually performed, nor carried to its final end—and therefore that all the possible damage described above is not produced. But there is scarcely a doubt, but that, on a general average, three-fourths of the value of the new manure, actually produced daily in the stables, is totally dissipated, and lost in the air. Let it be remembered, that the richer the mass, and the larger the heap, the more violent and destructive will be the fermentation, and the greater the loss.

In addition to the theoretical views presented, and the statements of general results, which go to show the little value of manure that has passed through this burning process, I will mention a particular fact just stated to me by a highly respectable gentleman and practical farmer, near Petersburg. When he took possession of the farm on which he resides, he found on it a considerable heap of stable manure which had been brought from the town stables, and put in a heap, *for preservation*, as it is usually considered, to remain until it was time to apply it to the next year's crop. The succeeding occupant, (my informant,) made the application—and obtained from it scarcely any benefit. The manure was much *fire-fanged:* it probably had been thrown into a new and violent fermentation by its removal, and second heaping, in addition to all that is usually suffered in the stable yard.

If, instead of saving the manure according to any of the usual modes, the cleanings of every day were regularly thrown into the river, (as done in part, at the Richmond livery stable named above,) or into the fire, it would be not much loss of value, in the end, compared to the results now obtained —and there would be great benefits gained in other respects. Besides all other possible evils of keeping up a constantly hot fermenting mass in every stable yard, it serves, in town or country, as a breeding place for myriads of stable and house flies. These insects are prompted by instinct to deposite their eggs in the hot mass; and I have seen in the bulk when opened, the maggots which the eggs had produced in such prodigious numbers, that it alone satisfied me of the impropriety of thus providing hot beds and the best possible breeding establishments for these pests. It probably requires a certain combination of heat and moisture to effect the hatching so uniformly and in such great numbers. But whether hatched gradually,

or nearly at the same time, very slight observation of a livery stable in summer, will show that the horses, though standing in the stalls, are far from idle; for it requires incessant movements of their heads, feet, and tails, to partially relieve themselves from the continued attacks of legions of sharp-biting flies.

Equally ignorant and destructive management is found in regard to many other smaller sources of rich manures in towns—which are either given up entirely to corrupt the air and the waters, or but a small part of their value is used to nourish vegetables and improve the soil. I should extend these remarks beyond the reader's patience, or sufference, if every department of this copious subject was examined. I shall therefore pass by all these miscellaneous matters, and confine my remaining observations on town manures, to the means of avoiding the worst of the present losses caused by stable management.

In proposing other modes of economizing the value of stable manure, (and which are applicable also to street droppings, and to sundry other rich materials, not specially named,) I shall keep in view the existing obstacles to every such improvement; and therefore, even if all the changes recommended, were adopted, they would not constitute the *best* system that the most enlightened economy would fix upon. My directions and suggestions, moreover, will be made as concise as possible—and perhaps, may be altogether superfluous to those readers who will keep in mind the general principles that have been advanced and enforced, and who will simply aim, in practice, to avoid the manifest and great evils and losses of the present system of management.

First—supposing the supply of litter to continue, as now, very inadequate for making manure in proper quantities, and for sufficiently moderating the fermentation of the parts. In this case, the manure should never be heaped, but be kept thinly spread until removed to the land, or to be composted in the country with enough of other and poorer materials; and the removals ought to take place every day, or at not much longer intervals. Until so removed, the manure should be protected as much as possible from sun, wind, and especially from rain, or other water so abundant as wash away, or to carry into the earth, the juices of the manure. But all these circumstances, injurious as they may be, are not so wasteful and destructive as the usual hot and violent fermentation. A cellar, or basement floor, under the plank floor of a public stable, if easily accessible to carts, offers the easiest and best means for cleaning out, and disposing of the manure as made; but heaping there, also, should be avoided, if to remain even 24 hours; and thorough and equal soaking of the urine through the solid parts of the manure, should be secured. The earthen floor of this cellar, or of the stable itself, if there is no cellar beneath, should be covered once or twice a year with a layer of rich marl, several inches thick. This would save (by combining with and fixing) much of the rich fluid which otherwise would sink in the earth for want of absorbing litter, and ultimately be decomposed, and lost. When necessary to remove this temporary calcareous floor, it would furnish of itself one of the most powerful of manures, and be an excellent ingredient to mix with the putrescent matter.

It is an important object at present for town stable owners to procure such kinds of litter as are the *least* disposed to rot, because it will last so much the longer, and a less quantity will serve the purpose of keeping the horses comfortable; at the same time, the least putrescent of vegetable matters, and which on that account are now scarcely thought of as materials for manure, would be effectually decompossd, and brought to the proper state to feed growing vegetables, by the contact and chemical action of so large a quantity of rich animal matter. Thus it well deserves consideration whether very great benefits might not be gained by using as litter such new materials, as spent tanners' bark, saw-dust, the empty hulls of cotton-seed, (where hulled previous to expressing the oil,) and the waste of cotton factories. Very large quantities of one or more of these materials are furnished in most of our towns—and which now are thrown away into the rivers, or elsewhere, as altogether worthless. If these, and all other vegetable litter still were deficient, and rich and dry marl were cheap enough, *that* might substitute litter in part; and the daily removal of the wet portion, and the replacing it with from half a bushel to a bushel of the clean and dry marl, would keep the horses comfortable, and secure the liquid manure that would otherwise be lost.

Some of these suggestions might be rendered worthless, and others would be carried into use far more beneficially if the main deficiency of materials were supplied, in a ten-fold greater amount of straw, leaves, or other vegetable litter from the country. This would be best commenced if some individual, who is the owner of a town stable and also of a neighboring farm, would profit by these hints, and furnish both the demand and the supply. He would have both parts of the trade, and would make all the profit that it offered, and have no one to bargain with, or consult, but himself. But he would gain nothing more than would any two persons, the one a stable owner, and the other a farmer, who knew the values to be saved, and would so agree to act that nothing should go to waste. If the countryman would supply the stable with good litter of any kind, (leaves, or cornstalks, as well as straw,) and for remuneration carry back a load of rich manure for every load of litter, he would be making a most profitable exchange; and on the other hand, the stable owner after paying away this manure, would have left for sale more in quantity, and there would be more of value saved in it, than in his entire stock as now managed.

The cultivators of farms within short distances of our towns, have very great profits offered to their acceptance, by their using properly the quantity of manure to be obtained from the town stables, (independent of all other, and untried sources)—but, they have availed but little of their advantageous position, and cannot do much better, without adopting some steps which are now almost totally overlooked and neglected. It is not my present purpose to give directions for applying manures, or for farm management—but considering the general deficiences, in these respects, it would not be proper to omit stating that I consider it essential to the profiting in the best manner by town manures, that the following requisitions should be fulfilled: 1st That the land is to be either first made calcareous, or the putrescent matter

previously mixed or composted with enough marl to combine with, and secure it; 2ndly, that the rich town manure, be not suffered to pass through *violent and destructive* fermentation; and 3dly, as far as may be effected, that such manures be applied to crops as fast as brought to the farms, and, in preference to grain crops, to be given as top dressings to young clover, or other grasses.

[To be continued.]

THE IMPORTANCE OF GRASS CROPS—UNSUCCESSFUL EXPERIMENTS.

To the Editor of the Farmers' Register.

Port Royal, May 12th, 1837.

My annual contribution has too long awaited its convoy, which I now feel was perhaps incautiously promised, and without due reflection that the lapse of twelve months would find the ice as thick, and my nervous horror of the pen as great as ever. In truth, too, my want of alacrity is not a little increased by a natural reluctance to record, in lieu of successes rather triumphantly set forth, some retraxits, creating a discount even upon so small an amount. The latter, though less grateful, is a duty even more obligatory than the former, as its neglect would be a confirmation of error instead of truth, and tend to the increase of that distrust, (the result of hasty or prejudiced enunciations of only apparent facts) which, as I formerly remarked, is justly a formidable obstruction to the general reception of established truth.

The experiments stated in my former communication,* (to which I have not now the means of direct reference,) and which the experience of the last year has contradicted, were 1st, in regard to clover, orchard grass, and highland meadow oat grass seeds sown with rye, in the latter part of July, 1835, upon about 10 acres of very steep, and a portion poor land, and which the succeeding year exhibited a growth very superior to any I ever had on such land. I was thereby encouraged to sow the greater portion of my field the 1st of last August, and some a little later, (with the exception of about 20 acres on which no rye was sown,) in rye, which was put in with cultivators, and the clover sown thereupon. Although my foreman declares he never saw seed come up better, I was grieved to find, on my return home in October, that there was scarcely a spire to be seen; and the spring confirms the failure. This, it is true, was owing to a pretty severe drought soon after, and the omission of the harrow, as to which my instruction was lost sight of; but nevertheless, my confidence has been rudely shaken, if not destroyed in the success of a practice, from which, especially on light lands such as ours, I had hoped the most beneficial results. The experiment will, however, be repeated on a smaller scale by me, and I hope by others.

2dly. I spoke, though not very flatteringly, yet with some confidence, of the effects of green crops turned in as manure; and enumerated those from buckwheat, rye, cow-peas, and Indian corn sown broadcast. A more attentive observation has convinced me that the degree of improvement from all of them, is in the inverse ratio of the lightness of the land; and when the latter was greatest, the former is now, from the indication afforded by the growth upon it, scarcely at all perceptible.

Another result too, and that the reverse of my previous conviction, has been established to my satisfaction, at least upon light land, and that is, that they retain less of fertility imparted by green, than dry crops. There is a marked difference in favor of a strip sown in cow-peas and turned in after they were gathered, and of course, dry, over an adjoining one, which received two crops of buckwheat when in bloom. My inference from these facts is, that however much stiffer soils may borrow, and permanently appropriate, of the fertilizing gases which compose these substances in their green state, yet that the rapidity and violence of the fermentation excited in a hot and too permeable soil, so effectually prevents their retention, as to render them quite an unprofitable loan. Indeed, before I became bold enough to hazard any theory on the subject, my practice from observation alone had been conformed to it. My manures, of whatever description, for I know not how many years past, have generally been applied on the surface of my light land, even in corn. I think the waste but little before that receives its first (and with me except siding, only) ploughing, and that the fermentation is, thereby, retarded until the wants of vegetation require its products, whilst for even a longer period its similar application upon young clover and grass lands has claimed my decided preference over every other mode. In combination with marl, its effects have been thus most striking.

I touched briefly in my first contribution upon the benefits which I have derived, and am still further anticipating, from the extension of permanent pasture to lands whose steepness or infestment with sassafras, locust, &c., render them unprofitable subjects for the plough, but whose fertility eminently qualifies them for the richest pasture. Of such, my farm presents a considerable portion; as indeed what farm of any considerable extent does not? And what is the condition which it usually presents? When the grubbing hoe, *imbelle telum, cum multo ictu et gemitu*, has performed its ever recurring biennial task of scotching the hydra sassafras, persimmon, locust, &c., the scratcher repeats its toilsome up and down office until its product threatens its terminals with starvation; and the soil has all found its way to the bottom, and the gullies to the top. What a contrast does not such hideous deformity afford to the rich and smiling aspect of the undulating bosoms of verdant slopes studded with picturesque clumps of beautiful trees (for there are few more so than the locust and sassafras,) affording shade to the fat kine luxuriating beneath? How often, years back, in my northern peregrinations, have such contrasts made me long for the sight, on my return, of such oases in our deserts, and which, until within a few years back, I had almost thought attainment hopelessly denied us by our soil and climate. A little perseverance has convinced me, as happily it will others, of the contrary. An orchard of a few acres adjoining my dwelling afforded the first encouragement. After having remained somewhat accidentally unbroken for five or six years, it took on a rich cover of greensward and white clover, whose increasing value soon determined me to let it remain; and so it has remained now for twenty years, unviolated by the plough. Another lot of about ten

* Inserted at p. 61, vol. iv. Farmers' Register.—Ed.

acres on the opposite side of my house was not long after laid down in orchard grass and highland meadow oat; which the severe grazing to which that, as well as the other has been subjected, has supplanted chiefly with the former growths, of all others the most untiring, and best for permanent hard grazing. The only aid which they have had during the whole period, has been an annual plastering of a bushel per acre, and a slight top-dressing of ashes and coarse farm-yard manure.

But why need we look beyond our yards, even in the sandiest and least propitious situations, for illustrations of the fact, that a little time, and manure, aided by the shade and fertilizing properties of that invaluable tree, the locust, suffice for these effects? My first experiment, upon such land as the hills above referred to, commenced about five years ago, when I wished to enclose eight or ten acres of such land for a few pet deer. This was effected by availing myself of two gullies running considerably more than a moity of the circumference, upon the exterior edge of which a very moderate fence sufficed (or would have sufficed, for they have not yet occupied it,) for those nimble animals, whilst the remainder of course claimed a higher fence. The sassafras and locust grubs, which infested it to a greater degree than any land I ever saw, were thinned out to the most promising, which were suffered to remain—the land well prepared with a hoe crop and sown in the fall with orchard and highland meadow oat seeds. The whole of it has since been top-dressed, and a small portion limed. The sassafras and locust sprouts to which the stock were at first invited by a slight sprinkling, after rain, with salt, have entirely yielded to the hoof and the tooth, whose continual persecution seem only to be hastening the above-mentioned process of substitution. *En passant*, and particularly until the land is completely set, they should be excluded for a year or two, until many of the seeds are ripe. This spring has witnessed a similar conquest of about equal extent of the hillside upon which the successful experiment of the early sowing of the clover with rye was made, and the labor of enclosing which, very substantially, was reduced to a trifle by the same means. It is true, Mr. Editor, these results are not to be attained without some time and some labor. Let no one expect good grass on poor land, and that in a single year, or two. If he will only look at the labor bestowed on this subject, in England, in the process of turfing land for pasture, whilst he will renounce such folly, he will be still more convinced of the importance of the object. Truly I consider it to agriculture, of all others, the most so; and my conviction was much strengthened by an agricultural visit, which amongst others, I made last summer to the justly celebrated Earl Stimson of New York, in whose praise it may suffice to say that I found him all that a farmer and a gentleman should be. His entire system, his rotations, his provision, preparation and application of manures, and the admirable arrangements of his farmstead, have all been minutely and accurately described by an abler observer, in the first volume of your Register, and need not be repeated by me. His most briliant results, however, even the one almost incredible to us, of 160 bushels corn to the acre, seemed to be resoluble chiefly into grass, and the abundant supplies of rich manure which every crop receives therefrom, rather than any superiority of cultivation. Yet, with a blind fatuity, we reason and act as if the earth was made only for corn, wheat, and tobacco, and would continue to produce these, in interminable succession, by scourging alone, instead of from alimentary manures which can be produced of the requisite quantity and quality by grass alone. But, Mr. Editor, can any man, having within him the bowels of compassion, at this moment, when we have not had a drop of rain for more than three weeks, ride along our roads and see our starved herds, in whose ragged carcasses and unfed sides the cornstalks have barely kept a little life through the winter, contending like "fire-eyed disputants" for here and there a scattered blade of grass, without having them wrung with pity? Old mother earth, too, claims her share, for she seems to cry out, "spare! oh, spare me!" and receives only for reply, "*a la mort.*" "This way no hope is," and who pursues it, pursues inevitable sterility and poverty. But where is the refuge? We must have milk and butter and meat for our families. I say, in grass. To its attainment, devote even your best lands and all your manure, and fear not but that it will soon repay you with compound interest in the increased fertility of all your land, and abundance of all your crops. Many a swamp and many a ravine, too narrow, and too detatched, or too much shaded, for corn, and therefore deemed useless, will give you tons of the richest hay, and manure annually, a surface equal to its own. It is the first step alone which costs—the rest are comparatively easy; and as they are followed up, I venture to predict, from my own experience, that crops of grain will increase pretty much in the ratio, (*sub modo*, of course,) in which portions of the land are are abstracted from cultivation for grass. Whilst nature, then, if not through all, through so many at least of her works, seems to cry aloud, "grass, grass!" shall we continue obdurately deaf to her invocation.

As my sheet is growing short, Mr. Editor, I cannot, perhaps, better fill up the remaining space, than with a brief description of an innovation adopted by me for the last six months in the *primum mobile*, the principle of labor, upon which all our operations must depend. Resolved, for the balance of a somewhat restless and migratory life, to keep, as far as circumstances will permit, at home, it occurred to me, that the amount heretofore appropriated to the wages of an overseer, distributed in premiums according to service and merit amongst my negroes—in other words, that avarice, combined with pride and vanity, strong principles even in the breast of a negro, if judiciously directed, might form *stimuli* not less efficient than those to which they had been previously subjected; that is to say, that compulsory might thus be beneficially substituted by voluntary labor. With this view, their unanimous assent having been previously accorded to the authority of the foreman and the justice of his awards, my force, consisting of about twenty effectives of all sorts, were divided into three classes, according to efficiency, age and sex, and made subject to degradation to a lower, or advancement to a higher grade, according to delinquency or desert. The compensation is allotted to the classes in full shares to the first; half shares to the second; quarter shares to the third; any amount of forfeiture incurred in a class to be divided amongst its mem-

bers. The periods of decision are, Easter, when the operation of planting corn is fairly over; the Sunday after harvest after seeding wheat; and at Christmas. A blank is kept by me for the purpose of noting opposite the respective names any delinquencies, which, in presence of the hands the foreman is sometimes called on, without fear, favor, or affection, to report, if any. This morning, the first report, was made, without delinquency. The division of $50 was soon made, and nothing remained but to insert opposite each class the amount to which its members were entitled. The ticket was then handed to the foreman, with a request to my merchant in the village to credit them for that amount of merchandize, (other than whiskey) at the store; any unexpended balance remaining to their credit till the next dividend. It would have done your heart good, sir, to have seen them marching off to-day, with faces radiant as the moon, to buy each a holiday suit, or some article of comfort, and which will constantly remind them of their duty and its reward. I can say for this experiment, that never certainly in my life, have I had so much work, so well done, nor with equal cheerfulness and satisfaction, not having had occasion to utter an angry word, except to a little cattle minder, the irksomeness of whose employment will ever produce delinquencies, and all this with very little attention on my part. Some of my neighbors, however, predict, that I shall enter a retraxit on this point, before the end of the year; may be so—*nous verrons*. Also, that it will tend to foster discontent, and that spirit of insubordination which had its origin in abolitionism. On these points, neither, will I pretend positively to decide; but I cannot doubt but that the relationship between my slaves and myself has been greatly strengthened by the system, and that they could scarcely be pursuaded to change it by Arthur Tappan and his minions. By the by, I wish Tom, that is to say (though to honest, well-meaning folk Tom is a perfect Toby,) Old Nick had 'em. I am very sure he would turn the tables upon them, and commend to their lips something too hot even for their hellish sup, and if he did not give them a little turn of Oliver le Diable, at any rate hold 'em very "oneasy." You have now Mr. Editor, my holiday issue, which I fear me you will find like too much other paper of the day, and in somewhat of a harlequin dress too, which mayhap, you will think befits "Old Tyro."

Very respectfully,
Your friend and well-wisher,
J. H. BERNARD.

From the New England Farmer.

NEW ZEALAND FLAX—(PHORMIUM TENAX.)

Mr. Editor :—I have lately introduced a few of these very rare plants from France, in the confident expectation that in many parts of our country, we shall most assuredly find a congenial climate and soil, and that the plant may prove a most invaluable acquisition to our favored land.

The *phormium tenax* is a native of New Zealand, an island, or rather a group of islands, lying between the parallels of 35° and 45° of southern latitude. I send you a leaf of the plant, a stout, strong flag, from three to four feet long, and near 2½ inches broad—but even in England and in Ireland, the plant produces leaves from five to eight feet long, and of a breadth in proportion.—In many parts of our country, they may attain to far greater dimensions. The plant is a variety of flag of an ornamental appearance. The blossoms which are produced on a tall spike, are stated to be smaller, but more numerous than those of the flag.

In England as well as in Ireland, in latitude 52° and 53°, it has been long tried in several gardens, and there found to be a perfectly hardy plant. Possibly, however, it may not be able to sustain, without protection, the extreme rigors of the winters of the more northern states. As the leaves of the plant are gathered in autumn, it may perhaps require that slight protection of a very thin covering of moss, which we are accustomed to bestow on many herbaceous plants, not, however, sufficient to smother and destroy, but merely sufficient to break the force of cold winds, and as a screen from the pernicious rays of the sun during winter. I am unable, as yet, to say whether such slight protection may or may not, be required for the *phormium tenax*, in some of the states of the north. So inconsiderable, however, is the expense of labor or of time, that I am persuaded an active man would be capable of securing with a slight covering of moss, an acre of plants in a single day.

The *phormium tenax* is a perennial herbaceous plant, the leaves resembling those of the flag. With very little preparation, they form clothing, canvass and cordage. The two last of which are stated to be incomparably stronger than any thing of the kind, made of hemp. The leaves of the plant grow in Ireland from five to eight feet high; these are cut in the fall, and the next year will produce a new crop. The plants may be raised from seeds or from offsets, which are very numerous; these however, should not be separated until the fourth year. The leaves which are cut in autumn, are succeeded the next summer by a new and luxuriant crop. Mr. Salisbury has found that a plant three years old, will produce thirty-six leaves, and six leaves have produced one ounce of dry, available fibres; and at this rate, he has calculated that a single acre set out, the plants at three feet assunder, will yield more than sixteen hundred pounds of the prepared flax to the acre, which is a great produce compared either to that of flax or of hemp, and the fibres are separated with much less labor than either of these require. The leaves are cut in autumn when full grown, and after being steeped for a few hours in stagnant water, they are passed between two rollers, the upper one of which is properly loaded, which causes the fibres to separate, and these being washed in a running stream, become instantly white. The natives of New Zealand make their most choice clothing of the long, slender fibres, beautifully white, and lustrous as silk, and of the leaves split in strips and tied together, they make fishing nets of extraordinary size.

The government of Great Britain fully aware of the superiority and importance of this plant, have taken great pains by acts of their legislature, to encourage its cultivation, both in Britain and in Australasia—but most all the seeds brought by voyagers, lost their power of vegetation.

Singular, however, as it seemed, the identical plant was at last found flourishing luxuriantly in the south of Ireland, in several gardens in Waterford,

Cork, Limerick, Louth, Dublin and Wicklow counties, latitude 52° and 53°. In one garden it had flourished for thirty years, or from its first introduction in 1788, and had been found perfectly hardy, during which time it had been only twice but slightly affected by frost in the tops of its leaves.

If hardy in Ireland, it may be hardy here. Yet though our winters may be more severe, our summers would be productive of a growth far more luxuriant than theirs, as the peach and the maize both flourish here, but will not grow well there.

A factory to employ from 200 to 300 workmen, and on a most extensive scale, was begun in 1831, at Grimsby in Yorkshire, England, for the purpose of manufacturing cordage and canvass from the New Zealand flax exclusively. For this material, they relied on New Zealand and Australasia, where its cultivation has already commenced.

Respectfully your friend,

WILLIAM KENRICK.

Nonantum Hill, Newton, May 25, 1837.

From the Maine Farmer.

"CARRYING COALS TO NEWCASTLE."

The adage which we have used above as a caption, arose from the fact, that as Newcastle in England was the grand source of coal, many of the plans and proceedings of mankind, might be considered about as preposterous, as it would be to ship coals to that place. Yet we see, every day, instances which remind us of this adage. Many of these instances arise, either from the ignorance or supineness of those who are the recipients of those things which others bring them, when by using half of the exertion and enterprise which their providers do, they might have the very articles at their own doors at a less price. We have been led to this subject, by persuing the conclusion of certain remarks of Mr. Ruffin, Editor of the Farmers' Register, in Virginia, respecting the bounty on wheat in Maine. After stating, as it was so rare that any legislative body in this country attempted to aid the improvements or to promote the interests of agriculture, he felt a reluctance to dissent from the measure, he observes that "we believe that there is an indirect, though far more efficient, as well as a far cheaper mode of reaching the end proposed.

"This would be by giving bounties or rewards for experiments (scientific and practical) calculated to discover whether there is not some radical defect in the soils of Maine, that unfits them for profitable wheat culture, and thence to arrive at the knowledge of the proper remedy wanting. We fully believe that such a defect exists, that it would be ascertained beyond all question—and the remedy as clearly pointed out. The lands of the New England states in general (excepting only alluvial river bottoms and other good soils, rarely to be met with, and in small quantities,) are very unfavorable to the growth of wheat, and its product appears from the general complaint made, to decrease as the country is longer and better tilled, and, as in general, other products are thereby increased. The soil generally, on account of its geological formation, is very slightly provided by nature with lime, an ingredient necessary for every vegetable product, but particularly so, and in large proportion, for wheat. We have never seen any of the lands of Maine—but have no doubt as to the truth of this opinion as to their natural constitution—and also, that to give lime to the lands is all that is wanting to make them yield good wheat. *It is a shame to both Maine and Virginia that so much lime is annually brought from the former to the latter. If Virginia made her own lime from her own abundant materials, and Maine used much of her lime to manure her lands, it would be better for both countries.*"

To this latter clause we say amen. What are the farmers of Maine and Virginia dreaming about? The latter, with inexhaustible sources for lime, buy the article of us, and we with a soil either already rendered capable of growing wheat, or that may easily be made so, go to Virginia after it. Verily this is like carrying coals to Newcastle. Now we would not have the Virginians use a particle less of lime, but they ought to make it at home. Nor would we have our lime burners sell a particle less, but it should be sold to our farmers at home. Commerce would not suffer a farthing, should this take place. There are articles enough grown and manufactured in each that could not be produced in the other, the exchange of which would give full employment to our merchants and seamen. We hold it to be an imperious duty for every people to make the most of their own natural resources, this will give strength at home, and at the same time put them in a situation to extend their commmerce with distant friends to better mutual advantage. In regard to his remarks on the soil of Maine, he is in part correct. We have much land that is not *naturally* good for wheat, but we have much more that is. We have an abundance of limestone—some of which is magnesian, which is very good manure, Sir Humphrey Davy to the contrary, nowithstanding—some of it secondary, and much more of it of a kind that may be called argillaceous, having a large quantity of argillaceous matter with it. The trouble in Maine is not so much in her soil, as the lack of cultivating wheat.

The bounty spoken of, is operating as a grand stimulus. More wheat has been sown this year than for many years past, and as the lumbering and moonshine speculation is on the wane, we hope that industry and common sense will have more sway. If we can get our farmers generally interested in the wheat culture, their own good will prompt them to study out what is wanted in the soil, to give them the greatest crop. This puts us in mind of a subject nearly connected with this, viz: *Ruffin's Essay on Calcareous Manures.* We have in a former volume noticed this work, and given extracts from it. It is decidedly the best work on the subject that has ever appeared; and we wish it could be more read by the agriculturists of the United States. There is much in it, of course, local in its nature, or more applicable to the author's section of the country than to many other parts of the union; but there is also much adapted to the case of almost every section of the nation. We think it would be a good plan for agricultural societies to purchase quantities of them to distribute as premiums, and thus, while stimulating some to action by the hope of the reward of approbation, they would redeem their pledge, by bestowing valuable knowledge, to the successful competitor.

From the Transactions of the Institution of Civil Engineers.

ON PROCURING SUPPLIES OF WATER FOR CITIES AND TOWNS, BY BORING.

COMMUNICATED BY MR. JOHN SEAWARD, M. INST. C. E.

A French gentleman of our acquaintance having recently addressed us upon a project of supplying the different towns of France with water, by means of boring in the earth, according to the method which has come lately a good deal into fashion in different parts of England, and thus having brought the subject under our mature deliberation, we offer the following remarks, which we were led to give in reply, with the hope that they may be found not altogether uninteresting to the Institution.

In the first place, as respects the project of furnishing water to the different towns of France by means of simply boring in the earth; if by this is intended that the various towns are to be supplied with water economically, for all domestic and manufacturing purposes, in the same abundant manner that is furnished to the inhabitants of London and other towns of England, we must at once declare without any hesitation that, as a general principle, the scheme will be abortive, and if attempted, will infallibly end in loss and disappointment.

In stating thus explicitly our opinion, we do not wish to be understood as being anywise unfavorable to boring in general; on the contrary, as an art when employed under suitable circumstances, we know that it can be made, on various occasions, highly subservient to the wants of man; but we also know that with many persons, a very erroneous opinion prevails as to the economy, and other merits and advantages of the art.

The method of "simple boring," as it is called, is not adapted for all situations and places; it requires a combination of circumstances not generally met with. London and the surrounding district, wherein this art has been most successfully practiced, is highly favored in this particular; the stratum of soil is a bed of clay, varying from 100 to 200 feet thick, and is therefore very easily bored through. It is remarkable that the springs under the bed of clay produce the finest and most salubrious water, while those above the bed of clay produce water so impure as to be unfit even for the most ordinary purposes. It is therefore easy to conceive, that this method would here meet with the most favorable encouragement; but in districts where the same circumstances do not exist, there would not be the same inducement to follow it.

"Simple boring," is suitable only when the quantity of water required is comparatively small; thus if the object be to furnish a very superior water for a nobleman's mansion, for a small village or neighborhood, or even for a single manufactory, then this method is admirable, provided the circumstances are in any proportion as favorable as in the district which surrounds London; but if the question be to provide an abundant supply of water for a large town or populous city, then certainly in every case, the method of boring should, on the score of economy, be the last that ought to be resorted to for the purpose.

That the bowels of the earth contain springs of water in abundance, there can be no doubt; miners and colliers are aware of this fact, to their cost and sorrow: but we know full well that those same springs, if they have sufficient natural force, must find their way to the surface of the earth somewhere, without any boring, and then form rivers and flowing brooks. Why then delve a great depth at an infinite expense, to procure that which we can generally obtain so readily and economically on the surface of the earth?

There is scarcely a city or town of any magnitude but what has some fine river or copious brooks in its immediate neighborhood; these are the natural sources whence we should obtain our supply of water. But if the streams in the vicinity are so impregnated with deleterious matter, as to render the water unfit for domestic or manufacturing purposes, and if no ready method can be adopted for cleansing it, resource should then be had to the water that falls from the heavens; tanks and reservoirs, (similar to those employed in feeding navigable canals,) should be formed in convenient situations, to receive the rain-water which falls on the adjacent hills: either of these means would furnish an adundant supply of this necessary element, constantly and economically.

It is perfectly true, that a populous town may be so situated as to be at an inconvenient distance from any salubrious river or brook, whence to obtain water; and local circumstances may be such as to render it impossible or inexpedient to form in the vicinity tanks or reservoirs to collect the rain-water from the hills; in this case, there appears to be no alternative but that of obtaining a supply from the bowels of the earth; in such a case, it will be necessary to sink very capacious wells or shafts to a great depth, with suitable pumps and steam-engines, to bring the water to the surface; and even then the supply may be so scanty as to render it necessry to drive (in various directions) horizontal level or galleries from the bottom of the wells or shafts, in order to break in upon the springs which may exist at a distance; similar to the method practiced in the salt-works of England, to obtain a copious supply of the brine; but in such a case, to expect that by simply boring down into the earth, a plentiful supply of water can be obtained for the domestic and manufacturing purposes of a populous town, is to expect what rarely or never can be accomplished.

The modern plan of boring to obtain water has been, without any rational grounds cried up as a new and wonderful discovery; but the truth is, that boring is an operation of great antiquity; the miner and collier make use of it in a variety of ways, and it has, from time immemorial, been a useful auxiliary to the well-digger; he employs this process to discover where springs of water exist. By this means he can, at a comparatively small expense, determine whether the situation is favorable or not for forming a well; at the same time he can ascertain the quality of the water when obtained, and the probable ultimate expense which must be incurred in order to secure a regular supply.

In some instances it has happened that in boring, from the cause just stated, the water has of its own natural force risen up through the hole, and flowed over the surface in considerable quantity, and thus, without much further trouble or expense a tolerably copious supply has been obtained.—This circumstance it is that has brought into favor

the idea of depending on simple boring alone as a regular systemetic method of obtaining a supply of water; and it is but right to say, that the method, in many instances, has been remarkably succecessful; but it should be borne mind, that the supply, copious as it is called, has scarcely in any one instance exceeded what would be required for a moderately extensive manufactory, or for the domestic use of a very small village; morever although considerable success has attended many of the experiments made to obtain water in this way, yet it is most certain that, as regards the obtaining of an abundant supply by the simple process of boring alone, in a majority of cases, the method has *completely failed*; and, after a very heavy and useless expense and loss of time have been incurred in these failures, resource has at length been had, either *partially or wholly*, to sinking a well.

The most rational plan for obtaining a good supply of water from under ground is in the first place to sink a well to about half the depth at which it is supposed the spring of water exists: thus, if the spring is judged to be 100 yards below the surface, then the well may made 50 yards deep; this being properly built up and secured, the engine erected, and suitable pumps fixed, the remainder of the depth to the spring may be pierced through by the process of boring, and in this way a copious supply of water is frequently obtained, and, as may be readily judged, the quantity of water obtained will vary according to the greater or less depth to which the well is formed; but at the same time it should be observed, that the deeper the well, the greater will be the expense of raising the water to the surface.

If necessary, we could here enumerate a long list of losses, failures, and consequent disappointments, which have attended the process of boring within our own observation; for the present however, we shall confine ourselves to two instances.

About four years ago we erected, almost in the heart of the metropolis, a 14-horse condensing engine for a manufacturing purpose. As a good supply of water was wanted for that and other objects, the proprietor of the establishment thought he could obtain this necessary element on his own premises, and make himself independent of the water-companies. We recommended him to sink a well at once; but contrary to our advice, he determined to try the process of simple boring, the situation of his premises being judged very favorable for that purpose. A hole was consequently bored to about 100 yards deep, and after some labor and expense, water was obtained, but the supply was so scanty as not to be half sufficient for the 14-horse engine, several attempts were made to remedy this, but without effect; the hole was at length abandoned, and a well was then formed, though not so deep as it should have been; boring was then resumed to the depth of what was considered the main spring: pumps were put down the well, and water was again obtained; but even after all, the supply was barely sufficient for the engine. The result of this business was, that the proprietor, after having his premises in confusion for nearly two years, in the end expended double as much money as would have formed a good productive well, and the interest of the money expended is considerably more than he would have had to pay to any water company for all the water he required for his engine and manufactory, besides losing a considerable portion of the power of his engine, which is expended in drawing the water to the suface.

Within a quarter of a mile of the above-described well was situated a brewery furnished with a similarly-constructed well, from which a considerable supply of water had been obtained; it is, however worthy of remark, that no sooner did our engine commence drawing water from the new-formed well, than the brewers immediately lost a great part of the supply they had previously been accustomed to derive from theirs; the consequence was, they were under the necessity of sinking it deeper, and of putting up more powerful pumps, in order to obtain their former supply.

We mention the above fact to show that, although there is no question but it is possible to find a spring of water in almost any situation, yet the springs do not furnish that inexhaustible supply of water which some persons imagine; indeed a bare consideration of what is accomplished in mines and collieries must convince us of the truth of this fact; were the springs of that inexhaustible nature some pretend, not a single mine or colliery in the universe could be worked to any moderate extent whatever.

The second instance of failure in boring, which has happened in our own practice, we shall now proceed to relate. About twenty years ago a canal was cut in the neighborhood of London which passes over a very hilly tract of land, and in the summer months there is great difficulty in obtaining a sufficient supply of water for the upper level. It is true the canal passes very near some copious brooks and streams, which with little expense or trouble might have been made available to supply every deficiency twenty times over; but from some circumstances the proprietors of the canal were not permitted to take advantage of these facilities, and as the rain-water they were enabled to collect from the hills was inadequate, they were under the necessity of resorting to the bowels of the earth to supply the deficiency. For this purpose, a large hole was bored down at the side of the canal, to a depth of two or three hundred feet, to what was understood to be the main spring; the water speedily rose and flowed over the surface; however, it was soon discovered, that the quantity obtained by this means was so very small as to be of no practical utility: a well of large dimensions was then sunk down about 80 feet, the boring still continuing to the original depth; pumps were fixed, and machinery worked by horses; the supply of water by this means was increased tenfold, but still was inadequate for the purpose required. We were then employed to erect a steam engine with suitable pumps, &c., and the well was sunk to double the original depth; a much more copious supply was now obtained, and the navigation thereby greatly assisted; but after all, the expenses attending these works, and the pumping up the water from such a depth; and that too still inadequate in quantity, are evils of such a serious magnitude, that these joined to other circumstances attending this property, will probably before long cause the whole of the concern to be abandoned.

We could add many other instances of the total failure of what is called the simple boring system; of works begun and never finished to any useful purpose; of others pertinaciously carried on for

four or five years, until the patience and the funds of the parties were alike exhausted; but we think enough has been stated above to prove to your satisfaction, how very uncertain has been this method of obtaining water. We think it right, however, to guard against the impression that boring for water is a bad system; on the contrary, allow us to repeat that we think most highly of it; but then only under proper management, and as a useful auxiliary to the sinking of capacious wells.

With respect to the project generally, of forming a regular establishment for the purpose of supplying water to the various towns of France, we have to remark, that there can exist no physical impediment to the accomplishment of the plan; there is no question but every town in France might be made to enjoy the same inestimable advantages possessed by the inhabitants of London and other towns of England; that is say, a constant, abundant, and an economical supply of good water, for all purposes of domestic and manufacturing use; but of the three modes by which this can be accomplished, the one by boring or well-sinking is decidedly the most expensive, and the most uncertain in the final results.

From the same.

SOME ACCOUNT OF SEVERAL SECTIONS THROUGH THE PLASTIC CLAY FORMATION IN THE VICINITY OF LONDON.

By William Gravatt, F. R. S., M. Inst. C. E.

Tring Hill Herts.

A boring for water for the Grand Junction Canal commenced at 25 feet below the summit level of the hill near Marshcroft Bridge.

Chalk	20 feet.	
Hard blue clay	30	
Blue stone	4.	At 54 feet the water rose to the top and ran over 1360 cubic feet in 24 hours.
Hard blue clay	47	
	101 feet—no more water than at 54 feet.	

The boring discontinued in November, 1837.

A second boring in the same hill commenced 20 feet from the summit level.

Chalk	30 feet.	
Hard blue clay	34	
Blue stone	4.	Water rose up. The stone required punching before using the auger.
Blue clay	82	Strata of indurated clay at about every four feet, so hard as to require punching from two to ten inches.
Black grit	10	
Blue clay	108	very hard.
	268 feet.	Boring discontinued—no more water than at first. These two borings cost £145 and were three months in hand.

Norwood, near Standwell.

A well four feet in diameter, sunk and bricked 280 feet through the blue clay, into the sand; the instant the sand was reached, the water rushed up to the top so fast as to endanger the workmen; it now stands within 8 feet of the surface of the canal, which is 86 feet above Trinity high water-mark.

Boring at Brentford, six miles from London.

Brick earth	8 feet.	
Sandy gravel	7	
Loam	5	varies from one to nine feet.
Sand and gravel	4	varies from two to eight. Contains water.
Blue clay	200	
	224 feet.	Boring discontinued—still in clay.

Woolwich Sandpits.

Alluvium of various depths.

Rolled flints with sand	12 feet.	
Clay, striped brown and red, a few shells	6	water merely drops.
Blue and brown clay, many shells	9	
Iron shot sand, with ochreous lumps	9	
Greenish sand, *clean*	8	
Greenish sand with flint pebbles	1	
Light ash-colored sand, perfectly clean	35	
Green sand, with green chalk	1	
Chalk	unknown,	

Plumstead Common.

Shafts for Chalk.

No. I. Alluvial gravel, and pure ash-colored sand	120 feet.
Chalk penetrated to	24
No water at	144
No II. Alluvial gravel	36

Stopped by the water.

No. III. At a small distance from this, stopped again by the water at the same depth.

N. B.—These three shafts were in the same field.

Boston Heath, near Woolwich.

A well sunk for water.

Gravel	65 feet.
Sandy beds	65
Chalk	70
	200

The water stands only five feet deep in this well; a trifling supply of water was found in the gravel.

Lewisham loam pit hill.

Alluvium various.

Striped sand, yellow, fine, and iron shot	10 feet.

Striped loam, and plastic clay, with thin seams of coaly matter	10
Yellow sand	3
Lead-colored clay, with casts of leaves	2
Brownish clay with cytherea	6
Three thin beds of clay, the upper and lower with cytherea, and the middle with oysters	3
Loam and sand	4
Iron shot sand, with flint pebbles	12
Coarse green sand	5
Clean ash-colored sand	35
Green sand	1
	81

Chalk with nodules of flint, unknown.

Redriff drift shaft.

	Ft.	In.
Vegetable mould	6	9
Brown clay	0	9
Gravel with water	25	8
Blue clay	3	0
Loam	5	1
Blue clay, with bivalve shells	3	9
Gravel and calcareous rock	7	6
Light blue soil with pyrites	4	6
Green sand	1	9
Leafy clay	8	4
	68	1

A pipe sunk by Mr. Turner 95 feet deep, near Bermondsey new church;—when they reached 80 feet, the rod sunk down 15 feet at once; after pumping out several tons of green mud, the water rose to within 25 feet of the top; it rises and falls about three feet with the tide; the water is quite clear and tasteless. At a place not 500 yards from this, they sunk a pipe 190 feet with very little success, the water being out of reach of a pump, and appearing bad.

From the same.

SOME ACCOUNT OF BORING FOR WATER IN LONDON AND ITS VICINITY.

By Mr. John Donkin, M. Inst. C. E.

Particulars of a well sunk at the Excise Office, in Broad-street, London.

In the first place, after excavating the upper stratum of gravel and loose soil, four cast-iron curbs were sunk, each six feet long; the lowest of these entered the clay about three feet; the digging was then continued through the clay to the depth of 140 feet, and a curb of brickwork within the iron curb was sunk the whole depth in the ordinary way, the iron curb serving merely to support the upper stratum, and to prevent the land water getting into the well. Boring was then resorted to, to the depth of about twenty feet, when the water appeared, and rose to within sixty feet of the top of the well; a copper pipe was then driven the last-mentioned twenty feet, to keep the passage open for the supply.

Wells sunk at Messrs. Brandram's vitriol and white lead works, Lower Road Deptford.

The wood and brick curbing was sunk barely thirty feet; the bricks were laid in Roman cement to keep out the water from the land springs; the well was then bored to the depth of about 180 feet into a bed or chalk, from which the soft water rises and flows to within nine feet of the top of the well, through wrought iron tubes riveted together. The strata are chiefly composed of yellow and green sand and gravel, like those found at the tunnel under the Thames.

Account of boring made near London, where the waters rises above the surface of the land.

In Mr. Wilmot's garden at Isleworth, a boring was executed to the depth of 327 feet. The blue clay was found to exist from about twenty-four feet below the ground level, with little variation of color, to the depth of 240 feet: it is then of a lightish red, and afterwards of a darker color very much variegated. At the depth of 308 feet it is blackish, and at 110 feet very black; at 311 feet it becomes yellow for some depth; then light green followed by dark green, out of which the water rises, being a stratum of about ten feet thick.

All the specimens, with the exception of the yellow, appeared to be clay; the yellow had a sandy appearance. The cast-iron pipe is sunk 327 feet, and is 2½ inches in diameter. The water rises about ten feet above the ground, and the well supplies eight gallons per minute. The land water here stands about sixteen feet below the ground.

Lord Cassilis has also had a boring executed in his grounds at Isleworth, to the depth of 290 feet; the quantity it supplies is about thirty gallons per minute, and its water rises about thirty feet above the level of the surface.

ON THE USE OF HAND RAKES IN CULTIVATING CORN—LISTING CORN LAND, &c.

To the Editor of the Farmers' Register.

Goochland, May 24, 1837.

Over the initials N. L. [page 33 vol. V.] there are a number of remarks on the subject of weeding corn with the rake; information requested as to the manner of preparing the land; the quantity of corn produced per acre under such cultivation; and various other questions. His remarks appear to be made more in the spirit of ridicule, than from a desire to acquire information. But, as I may be mistaken with regard to his motive, I will give him all the information I can on the subject. I suppose, from his wishing to know the nature of the land I have been cultivating, he is a stranger to me. I will, therefore, inform him that I have been employed for twenty years of my life as manager on some of the estates on James river, where I cultivated all kinds of land, light and stiff, rich and poor, high land and low grounds. And nine years of the time of my using the rakes were spent on some of those plantations; and, I believe, I hazard little when I say, that my employers will admit that I made as good, if not better crops of corn than any other manager they ever had. N. L. seems to think it impossible to have the land about the corn loosened and the grass and weeds taken from it, without the use of the hoe. I will admit, if I were to delay working my corn until the grass and weeds got the advantage, that the rakes would not answer so well.

But, as I said before, the operation should commence by the time the corn has three or four blades, and with a new-ground coulter running so near as to loosen the land from stroke to stroke of the coulter, thereby doing away the necessity of chopping around the corn with the hoe; which to say the least of it, is a most tedious operation, and I think, a useless one. As to the time taken in thinning the corn, it takes me no longer than any other person, according to the quantity of corn in each hill. But, if the plough and rake were to leave one half, or two thirds of the grass and weeds behind, as N. L. seems to think they do, then indeed I could not tell how long it would take to thin and hand-weed it. I do not suppose I should ever get rid of it. But, if the operation of the plough and rake is commenced in time, it will destroy ninety-nine hundredths of every thing in the row except the corn, thereby leaving but little else to pull up. In rich low grounds the narrow dock frequently puts up so thick as to make it necessary to grub it up with grubbing hoes, and, in some spots, the wild pea vine has to be scraped away before the plough; but, I have never thought of putting hoes in the hands of my negroes to make a regular business of weeding corn, since I commenced the use of the rakes. Indeed I made but little use of them for that purpose long before I thought of the rakes. I once cultivated one hundred and fifty acres of land in corn with twelve hands. I had a good team of horses, and substituted horse power for manual labor, and it was all old high land, unimproved, with the exception of about 18 or 20 acres of low grounds of the most indifferent on the estate. And, I am sure, there were not more than thirty acres of it weeded with hoes, or any other implement; and it was admitted by some of my old neighbors, (who told me they had known it fifty years before, when in its fresh state,)that they had never seen such a crop on the land before. It produced 815 barrels by actual measurement. I, therefore, think that the hoe cannot be of such vital importance as N. L. seems to think it. He thinks that the rakes cannot be used to any advantage except on soft light land. On such land as that, I frequently dispense with the use of them altogether; but, I think them of the greatest importance on stiff, rough land, as they not only take away all the clods from about the corn, but make the land, which is loosened by the plough, perfectly fine; which cannot be done by the hoe, and which I consider of much more importance than chopping around the corn with the hoe. Whilst I admit that the hoe is an indispensable implement on all plantations, I do not consider it of much use in weeding corn.

I will now inform him, as well as I can, on the manner of preparing my land. On all land which is fallowed after the winter, for corn, wheat, or tobacco, I use the log drag, already described in one of the former numbers of the Farmers Register,* and so highly recommended by Mr. J. M. Garnett. I consider it an indispensable implement to a good preparation. But as N. L. will not perhaps go to the trouble of fixing a log, he can make an experiment by reversing his two-horse rake. Turn it upside down,and put on suitable weight, according to the stiffness of the land, and it will answer the purpose fully as well, if not better than the log, and I will ensure that it will pulverize more land at one operation, than it would with the teeth down at three, and the land will not bake after a rain half as hard as that operated on by the rakes. All land which has been fallowed so long as to have settled, and become close, I work up with a five-hoe cultivator, drawn by two horses, and follow that with a log, which puts it in fine order for the reception of any crop.

As to listing land for corn, I admit it is "a slovenly practice," and one I never approved of; but, from necessity, I have been compelled to resort to it, and it has confirmed me in the opinion that it would prevent the worm from cutting the corn, which I had heard long before I experienced it. I shall hereafter resort to it on all land which I cannot fallow before Christmas, or directly after, as I also think early fallowing a preventive to the worm. As to the quantity of corn produced per acre, I once made, on a piece of branch flat, fourteen barrels; and on a piece of fresh highland, ten, without the use of the hoe; and, I am sure, if all the hoes in the country had been used in its cultivation, it could not have produced a better crop. It may be proper to mention, that, when I list land for corn, I run four furrows to the list, instead of two, which has been the common practice; thereby putting it in my power to prepare the land well for the reception of the corn, and leave a sufficient quantity of land each side of the corn-row for its cultivation, till I can find time to break the balks.

As to my being the author of narrow beds for corn, I disclaim all pretention to having introduced them; I never approved of them; and know that R .D. K. did not intend that any such construction should be put on his communication. All that he wished understood was, that I had improved the method of horizontal ploughing, by giving to each bed a gradual descent from the top of the hill to the bottom, so as to prevent the water from breaking across and washing the furrow. I am induced to believe I did introduce that method, inasmuch as I commenced it in 1819, and had never heard of its being done by any other person. I mentioned it to several old experinced farmers, who had never before heard of it. One of whom was Mr. Randolph Harrison, sen., of Cumberland, who commenced the practice directly after I told him of my experiment. And I have understood lately, from some of his acquaintances, that he still continues it, and approves of it very highly.

I would be glad to know who N. L. is, and become better acquainted with him; and, if he will come to see me, I can show him that I have not only preserved the cream of my land, what little it had, but will defy him or any one else to find a gully six inches deep which has been produced by my cultivation. Before I conclude, I must beg N. L. to give my experiments a fair trial before he condemns them. As I have recommended to him to turn his implements upside down, he may think my head is turned inside out. As he has requested of me my method of preparing my land, and the quantity of corn produced per acre, I would like to be informed of his mode, and the quantity of corn per acre; and, if I am convinced it is better than mine, I will with pleasure adopt it.

THOS. B. GAY.

* See page 616, vol iii.

For the Farmers' Register.

HORIZONTAL PLOUGHING—HILL-SIDE TRENCHES—HAND RAKES—USE OF GYPSUM.

King & Queen, 1st June, '37.

In the April number of the Register, we were favored with an interesting notice of a few items on Mr. Gay's farming. In reference to some of his topics, I have designed for some time, to call the attention of the readers of the Register; and in the first place, to the manifestly bad effects of what is commonly called "*horizontal ploughing.*" Though this kind of ploughing, when executed by a skilful hand, under the use of the rafter, or water level, may now and then present a level furrow or bed, I will venture to say it, that there is not, in eastern Virginia, a field of horizontal ploughing, nor would the community be benefited by greater perfection in the plan. Upon moderate slopes the plan is beneficial in proportion to its perfection; but, upon long and wide abrupt declivities, all attempts at *horizontal* ploughing are more or less injurious, and frequently, vastly more so than the old "up and down hill" plan. This will doubtless appear to many to be a strange notion; but let it not be repudiated until examined. It occasionally manifests striking benefits—has great plausibility about it, and many advocates, who are so, because they have fallen out with the old plan, and for several years been using this under both the influence of *prejudice* on the one hand, and favoritism on the other. But I must still ask leave to say, that "*horizontal ploughing*" in its usual modifications, *is just the opposite extreme* of "*up and down*" ploughing. Upon the moderate slopes, whereon the first exerts the greatest benefit, the last is but a little behind it, though certainly inferior. Where then lies the truth? As in most other matters, just between these extremes. While we should by no means be induced to plough on rolling lands up and down hills, we would equally deprecate the attempt to save the soil by the opposite course. We had far better let the water go its way down each water-furrow, which is commonly open after seeding wheat, down to the clay, or beneath the soil, than to permit it to embody, and make its destructive passage, not *on*, but *through* the whole body of the soil, by a thousand deep-cut trenches down the side of the hill. Many of our most noble hills, which should not only stand as monuments of the unspeakable wisdom and power of their great architect, from amidst which, and without which, he could not have given us the flowing stream or verdant meadow, instead of presenting the aspect of youth in all its vigor, beauty, excellence and power, stand like poor old women (pardon the figure,) who have borne children, kindly nurtured them, reared them to manhood, witnessed their ingratitude, seen them die or wander from home, who can now only pour the unavailing and unprofitable waters of sorrow down the many deep channels of exhausted nature! It is unfeigned, when I declare my deep sympathy over these poor old women—the hills of our nativity, and reproach the wretched conduct, called management.

But I said that the truth was to be found between the extremes. The ploughing then, must be neither horizontal nor up and down, but so *graduated*, as to be always inclined downwards towards the connected valley, and contrary to the natural fall of the hill. In other words, the water should never be allowed to fall towards the point or foot of the hill, but, crossing the side of the hill obliquely, empty itself, or embody in the valley. If it gathers on the side or down on the point, a gully will be very sure to result. If a gully should show itself in the valley, just throw in a little brush from time to time, so as arrest it. This *graduated* plan, will answer well on many kinds of soil. It is known to farmers, especially those of a hilly country, that some lands wash much worse than others. Much of this difference I conceive to be owing to actual poverty—a want of vegetable matter in the soil. We hardly ever meet with many gullies on new grounds, or fertile old land, unless they are badly managed. The tendency to gully is rather owing to art than nature, in all new or fertile lands. But the *graduated* ploughing itself, will not answer on extensive lands, unless aided by the *hill-side trench* system. This, added to the graduated ploughing, I humbly conceive, embraces and offers the most complete plan that can be applied to our hills. Farmers appear to be slow in taking up the trench system. They seem unwilling to lose a row now and then, not considering how many they lose instead upon the present plan. My experience is very limited with the trench, but so far as it has gone, it is highly satisfactory. I think Mr. Gay, however, gives too much fall. I give but two or three inches in thirty or forty yards. Lay off a trench every thirty yards on a large hill, beginning so near the brow as to receive with certainty all the water that may be thrown off from what we commonly call the level above, which level, (almost always very uneven, or having a general slope,) should be ploughed strictly horizontal, so as to keep as much water as possible for its own use, and at the same time prevent its operation on the hill-side. All the ploughing below is to correspond with this trench, say for fifteen rows, emptying as above described, contrary to the natural arrangement, then cut another trench, and so on. Few hills among us, would require more than three trenches; one answers in a great number. The trench plan, without proper graduation, is of no benefit—it cannot be made to hold the volume of water, which often gathers from a great rain. Trenches ought not to be very long. They are quickly made. All ditching required, on old high land, could be done in the way by which they are made, with a great saving of labor and expense. If the reader will deliberately and justly compare the horizontal with the up and down plan of ploughing, keeping in mind the period they have been respectively used, I feel confident, novel as may be the conclusion, that he will admit, *if no more*, that *horizontal ploughing, as in general use*, is but little if at all superior to the other. While the up and down plan has been in use time immemorial, with truly bad effects, the other, as every man may observe, who will take even a little pains to do so, has caused incalculable and utterly incurable evils in thousands of instances. In riding through the country, ask the date of the enormous gullies which every where intrude upon your notice, and compare it with the date of horizontal ploughing, and you will be satisfied as to the source of the evil. It is the unavoidable operation of horizontal ploughing, unless aided by some auxiliary, to

sweep away our hill-side soil, as well as to cut gullies. During the course of the cultivation of the corn crop, the land is laid almost entirely level by many farmers; consequently, there are no furrows left to hold water, if they could do it at first. But, the fact is, no water furrow can be made deep enough at any time, to retain the water of a great rain. We must then provide a substantial and permanent conductor for superfluous water, at such spaces as shall be adequate to control the gathering. While the plan which I have recommended will enable us to cultivate the corn crop in the most successful manner, it also offers the most perfect safeguard to our soil, during the early stage of the subsequent small grain crop. We usually seed in single beds in this quarter, so as to restore the old corn bed to something like the height which it had in the beginning of the corn crop, giving, between each two, a pretty good water furrow; now, it is during the period which is required for the wheat roots to take hold in the soil, that the most serious washing and gullying is done, which may be prevented by the *graduated trench* and *furrow*.

Having said so much on the subject of ploughing and trenching, I will endeavor to be more concise on the less important matters left. Being much pleased with the idea of the *hand-rake*, used by Mr. Gay, and so warmly recommended by a writer over the signature of R. D. K., I proceeded at once to provide a few. They have six teeth, and weigh about four pounds. They are probably a little too heavy. Only one of the hands, however, has complained of the weight. This instrument does very nice work, in light land, clean and well broken. I have not tried them in any other kind. I think that R. D. K. was a little hyperbolical when he said that a girl or boy could do as much as several men in a day. But, I think that such a girl or boy, with the rake, can do as much as a man with the hoe; and that is doing very well. So far as I have tried it, I feel pleased with the rake. Practical men are the persons who should be most highly regarded among farmers. I have been informed that Mr. Gay is a skilful, practical farmer. Will he not give the readers of the Register a summary or short account of his method of doing things?

A few words on the use of gypsum. Much has been said as to the use and operation of this article in farming, particularly as to its application to the clover crop. I have but little experience upon the subject. Some say it is good for nothing—some, that it often fails—others again, that it is of great value. Now, why should this be so? It can hardly be owing to a diversity of qualities in the article. Sulphate of lime is very hard to decompose, and what any section of country uses in a term of years, would hardly present much difference in qualities—not enough at any rate to account for being greatly good, and actually good for nothing. There is then, in all probability, some other way of explaining these discrepancies. And I will propose, as a mite upon the subject, the opinion of one of our most skilful practical farmers, who, I will take the liberty of introducing to you as Mr. P. B. Pendleton. I take the liberty of introducing both his name and opinion, (sustained as it is by his practice,) because I think it probable that he would not do so himself. The opinion entertained by Mr. P. is, that if plaster is applied during a space in which no rain shall fall for a few days, (none having fallen for a few,) that it will generally succeed in producing the best effects on clover. In other words, he recommends the application during, what the judgment of the farmer would call a dry spell. I do not know the quantity he uses to the acre, nor whether he prefers applying it in the morning or evening. If Mr. P.'s plan and opinion be correct, it will go far to explain many experiments, embracing all the different classes. In reference to the *result* of the practice, I feel confident that he is right, and hope that those who use plaster or clover without regard to weather, will think of it this and the next season. I plastered a part of a lot of clover this spring, during the long spell of dry weather which has continued, even to the present time, with an increase of two-fold I think, if not more. I usually apply, in the small way in which I have hitherto used plaster, half a bushel only to the acre. And now, if I may be allowed to add the testimony of *theory* to *practice*, I will say that plaster operates on the clover by being actually *absorbed* by the clover. If this be so, it is unnecessary to urge the importance of avoiding not only drenching rains soon after the application, but likewise high windy weather, as far as practicable. And now, that the *theory* is correct, I will leave to the test of observation. Dress a section of clover with plaster, and leave another (so remote that it cannot possibly be affected) undressed. Should the plaster take well, that is, neither be blown or washed off, it will be found that the plastered clover will have a great number of white specks, not on, but really *within* the substance of the leaf. These that remain visible to the eye, some large, some small, are constituted, I apprehend, of the coarser parts of the plaster, while the finer particles have descended by absorption down into the plant, stimulating and invigorating it. You may now examine most minutely the section unplastered, and not a white speck can be found. So I have found on observation. It may be of service to others to study again this old subject.

Should the editor of the Register think the remarks above offered, worth inserting, they are at his, and the service of the readers of the Register.

J. Du Val.

For the Farmers' Register.

IMPORTANT FACTS IN REGARD TO KEEPING APPLES SOUND FOR A LONG TIME.

Queen Anns' Co., E. S., Md.
June 2d, 1837.

I had this day on my table the first strawberries from my garden, and, at the same time, a dish of fine sound Newtown pippins from my orchard. They were not kept for the occasion; they have been used in profusion, in my family, since the first of January, and presents made of them to some esteemed friends. The apples were preserved by drying them in the sun for two or three days when first gathered, and put away in dry sand, so as not to touch each other. To have fruit throughout the year is desirable—it is a cheap luxury, and I think conducive to health. I have heretofore paid some attention to storing my apples, but have not before succeeded in preserving pippins till the ripening of the summer fruits. The sand ought to be perfectly dry, and clear of clay, which would give them an earthy taste.

I do not claim as an *original discovery* the means of preserving apples. Packing them in sand is common in this part of the country. The drying them I took from the New York Cultivator. I am satisfied that the combination is preferable to either of the means separately used. This is a small matter, but being within the scope of agricultural economy, I have supposed you would give it a place in the Register.

WM. CARMICHAEL.

From the (London) Farmers' Magazine for May, 1837.

SHORT NOTICE OF A NEW MANURE [MADE OF HUMAN EXCREMENT] MUCH USED IN FRANCE, AND A PROPOSAL FOR ITS INTRODUCTION INTO ENGLAND.

[The following article was found in our latest received British periodical, after the last of the foregoing numbers on "The Police of Health" was in type. This furnishes both newer and more particular evidence of the value of the kind of town manure under consideration.—ED. FAR. REG.]

Messrs. Payen and Buran, of Paris, having discovered a composition which disinfects human excrement, and all animal substances, and renders them the most fertilizing manure, perfectly free from any obnoxious odor, and in a pulverized state, now manufacture it on a large scale in France, where it is generally used. Some individuals, who have purchased the right and taken out a patent for the invention in the British Empire, purpose manufacturing it in this country; to effect which object they are desirous that a few capitalists, more particularly those who are interested in agriculture, should join them in raising the small sum which will be required for that purpose.

Allowing amply for all contingences, it is estimated by competent persons that £6,000 will be required for establishing a manufactory for the above manure; £4,000 of which has been already subscribed, and on which it can be shewn, by a moderate calculation, that fifty per cent. annual profit can safely be anticipated.

The following tables show the comparative expense and advantages of the old and new systems of manure, as tried upon two separate arpents (1 acre 2 roods 30 6-13ths perches); of the same soil in the neighborhood of Paris, by an experienced practical agriculturist, one being manured according to the usual custom of the country, and the other with the improved manure.

OLD SYSTEM.

Expense of Manure.

	£ s. d.
1st year, twenty cart loads stable dung, at 6*frs.* (4s 9*d* 1-7*d*) a load, which lasts for three years.	120*f.* 4 15 2$\frac{6}{7}$
2nd year - - - -	0*f.* 0 0 0
3rd year - - - -	0*f.* 0 0 0
	120*f.* 4 15 2$\frac{6}{7}$

Produce of Crops.

1st year seven setiers (30 bush.) of corn, at 20*f.* (15s 10 1-2*d*)	140*f.* 5 11 1$\frac{1}{3}$
2nd year, five setiers oats 21 bush. 1-8 pk. at 18*f.* (14s 3 3-7*d*	90*f.* 3 11 5$\frac{1}{7}$
3rd year, green crops	90*f.* 3 11 5$\frac{1}{7}$
	320*f.* 12 13 11$\frac{13}{21}$

NEW SYSTEM.

Expense of Manure.

1st year, eight hectolitres (15 cwt. 2 qrs. 16lb. at 5*f.* (3s 11$\frac{1}{2}$ 3-1)	40*f.* 1 11 9
2nd year, do.	40*f.* 1 11 9
3rd do., no manure	0*f.* 0 0 0
	80*f.* 3 3 6

Produce of Crops.

1st year, seven setiers of corn (30 bush.) at 20*f.* (15s 10$\frac{1}{2}$*d*)	140*f.* 5 11 1$\frac{1}{3}$
2nd year, seven setiers (30 bush.) of do.	140*f.* 5 11 1$\frac{1}{3}$
3rd year, five setiers (21 bush. 1-8 pk.) of oats at 18*f.* (14s 3 3-7*d*)	90*f.* 3 11 5$\frac{1}{7}$
	370*f.* 14 13 7$\frac{17}{21}$

From which it appears that with a reduced expenditure of 40*frs.* (£1 11s. 9*d.*) an increase of 50 *frs.* (£1 19s. 8*d.*) in the value of the crop was obtained, thereby giving a gross total advantage in three years of 90 *frs.* (£3 11s. 5 1-7*d*) in the new system over the old system, or at the rate of 30 francs (per French arpent,) or 28s. per English acre per annum.

We are also informed by the same individual, that the new manure possesses the following desirable qualities, viz: the decided improvement of the land, economy in the conveyance, cleanliness in the crops, freedom from weeds, the production of a stronger ear of corn, and, lastly, that long-sought for desideratum by the farmer, the destruction of the fly.

Extracts from reports of the different learned societies and the public journals in France, which have expressed the highest opinion of this successful discovery, for which the inventor received from the Academy of Sciences in France on the 8th September, 1834, a prize of 8,000 francs:—

Agricultural Society of the Seine and L'Oise.

Extracts from remarks on different sorts of manure by M. de Cauville. This society has voted the insertion of this paper amongst its memoirs, with the hope by this means of inducing agriculturalists to repeat the experiments of Mr. Decauville.

"Amongst manures there are several new ones; but many farmers, not knowing their value, hesitate to use them, and thus deprive themselves of valuable resources. Having this year tried some experiments upon several of them, I have now the honor to communicate to you the result.

"In a piece of clayey and chalky ground of the extent of thirteen French acres (nearly eleven English) which did not possess much fertility, I had some barley sown after two ploughings, and, at the same time, I spread the following manures. On the first part the blood manure made by Mr. Derosne; on the second, the animalized black (made by Messrs. Payen and Buran;) on the third, the disinfected soil [human excrements] of

Messrs. Payen and Buran; on the fourth, the Lainé manure; on the fifth, the Boulogne soil.

"In order to ascertain the duration of the different manures, I sowed some lucerne amongst the barley, and the following crops served to show those which act the longest on the soil; three farmers were chosen as judges, one a member of this society, who were ignorant of the manure which had been employed, and the following is their decision. All the manures produced some effect, compared with that part which had no manure, the most efficacious was the *disinfected soil;* the second, the animalized black; the third, the blood manure; the fourth, the soil of Boulogne; the fifth, the Lainé manure."

Extract from a report of Mr. C. Brianne, director of the model farm of Grignon, 20th September, 1834:—

"In a course of experiments, I manured about one hundred acres of rye and wheat with animalized black in the department de l'Aube, at forty leagues from Grignon; although the season was not favorable, one can inquire of the people of the country, if they have ever seen a finer crop in the world."

Extract from a report made to the Horticultural Society of Paris, by the Viscount Debonnaire de Gif.

"The result of my examination of the effect produced by this new manure in horticultural proceedings is this: that this pulverized compound appears to hasten the development of vegetables, and consequently accelerates their fructification; that it does not possess the bad quality of containing the seeds of weeds; that it improves by degrees the soil, and produces more abundant crops; and it can, consequently, be applied to garden plants, which exhaust the soil; nor does it impart any disagreeable flavor to fruits or vegetables. It likewise adds considerably to the growth and beauty of the dahlia and other bulbous roots. The facility of its conveyance is also a great recommendation."

Several attestations of persons, who have witnessed the disinfecting process both in France and England, are in possession of the individuals who propose to introduce this manure in England, and may be seen at T. G. Margary's, Esq., solicitor to the patentees, Quality-court, Chancery-lane, from whom any further information can be obtained.

N. B. Many preparations of night-soil have been used for some years, both in England and France, but none of them are allowed to possess the superior qualities of the one which it is now proposed to offer to the British public.

BONE DUST.

Upwards of ten thousand bushels of bone dust were sold at Maduff, Invernesshire, on Monday se'nnight, many people having come upwards of thirty miles for it. It is supposed that there could not have been fewer than three hundred carts in town; and a greater bustle was never witnessed by the oldest inhabitant.—*Ib.*

From Hillyard's Practical Farming.

SWEDISH TURNIPS.

There are three most essential requisites to obtain a good crop. First, the land must be congenial to their growth—clean, full of mould, and not very clotty. Secondly, a proper quantity of good manure, well covered in the land, and not exposed to the atmosphere so as to lose its nutritious qualities. Thirdly, seed raised from a sort proved to be good, drilled at the proper depth and distance and at the proper season. With these indispensable requisites, with favorable weather, and, if the plants are not injured by the fly, and well hoed (twice or thrice if necessary,) a good crop of Swedish turnips (which is of greater value than is generally supposed,) is almost sure of being obtained; but, if there is a deficiency of any of these requisites, it will be advisable to sow common turnips, and if there should be a deficiency of most of them, not to sow any; for half a crop of turnips, with a full crop of weeds, puts the land into a bad state, and by expenses takes money out of the farmer's pocket for as wasteful a purpose as if he ploughed his cash into the land. It is unnecessary, and in my opinion injudicious, to consume on the land by sheep the whole of a crop of Swedish turnips: it is making most land too rich for a good crop of barley; very heavy crops always produce corn of inferior quality; and, generally speaking, in all descriptions of grain, when the quality is inferior, the quantity seldom turns out so much as expected. The consequences arising from a layered crop of barley is generally a half, or perhaps a quarter of a crop of clover; and nothing can be worse, for the land will be covered; if crops do not come, weeds will, and thus injury is sustained in future crops. If half of a good crop of Swedes is consumed on the land, it is quite as much as it requires; the remaining half may be carted off to improve the quality of the manure in the yards, or to be consumed by sheep on other parts of the farm that may want enriching. Swedes wanted for stall feeding before Christmas should be sown the latter end of May; but, for that purpose only, the tops being likely to mildew in September, and the bottoms to rot in the spring. For sheep feed they may be sown as late as midsummer; common turnips from midsummer to the middle of July. The greatest weight of Swedes is to be got drilled on ridges, twenty-seven inches asunder, and the plants left twelve or fourteen inches apart. But drilled on a flat surface, in rows fourteen inches asunder, (care being taken that the manure is well covered) answers as well for spring sheep keep as on ridges, the turnips not being so liable to be injured as Swedes on ridges sometimes are, during a winter with a repetition of frosts and thaws. It is best to form the ridges, and sow the seed, when the land is moist, the plants then coming up earlier and stronger, and of course sooner getting out of the power of the fly. It is much better to have moist mould thrown on the dung than dry. I do not like, however, to have the ridges formed when the land is very wet, for then they are apt to become so hard and crusty at the top, that the seed plant (particularly mangel wurzel,) cannot work its way out of the ground. Most Swedish turnips run too much to top, and produce many worthless fangs at the root. By getting, a few years ago, seed from Sweden, I have got a kind that produces a small top, with a tap root only; and having widely circulated my seed, the Thorpeland Swedes are well known in many distant counties. Each year I sow a small quantity of any sort well spoken of, but have not yet met with any I like so well as my own; the

tops of which coming up weaker, they do not seem at first to promise so well for a crop as the coarser kind, and besides which the fly has more power on them. The fly is not one-tenth part so troublesome in some parts of England as it is in others. I am informed that in the north they are not so much troubled with it; and, from personal observation, I know they are not on the coast of Norfolk and Suffolk; the cold blasts from the great Northern Ocean do not suit them. I am inclined to believe that the sea fogs, so common on those coasts, are a benefit to the turnips grown there. There are few persons take the trouble of being so particular, as I am in raising Swedish turnip seed. I superintend the selection, and see that not one turnip is planted that has run out of shape. And, to prevent any inoculation by bees when they are in flower, I will not suffer any thing of the turnip or cabbage tribe to run to seed in my kitchen garden, although it is five hundred yards from where my seed is growing. When it is raised near a village, there is no security against inoculation. My ridged crop of Swedish turnips is this year unusually small; but I think I may, without presumption, say, I believe, that there is not to be seen at this time (August 31,) a finer or cleaner crop. To show the difference between the crops, I had some drilled on a flat surface, and, as I well knew, the ridges will certainly produce much the greatest weight per acre. By having nearly twice as many turnips on the flat as on the ridges, it might be supposed that a greater weight might be produced. I have tried the two ways, both sown at the same time, and found the ridged turnips so much larger, that they produced the greatest weight per acre. A Swedish turnip is doubled in weight by a small increase of its girth. * I have often been somewhat incredulous as to some of the reported weights per acre of Swedish turnips; for, having been for some years past in a sweepstakes with Lord Spencer, I consider, from the weights we have produced, five and twenty tons per acre, a good crop for regular tillage land that has, the previous year, borne a crop of white grain. Around Manchester, where they can obtain such immense quantities of good manure, and have, during the summer, three times the quantity of rain that we have in this county, they can produce a greater weight per acre of Swedish turnips than we can; for turnips cannot have too much rain. I recommend that land intended for turnips (but think it not so necessary for corn) should be ploughed up at the beginning of winter; and if it is free from couch, and intended for Swedes, a small quantity of dung ploughed in, (not too deeply,) will produce good effects, by causing the infant plant to grow stronger and quicker, and therefore sooner free from the attacks of the fly.

After numberless trials to prevent the ravages of the turnip fly, the only way which I found at all successful is, to collect all the weeds I can on the farm, and lay them in heaps all around the field sown with turnips; on the plants coming up, and showing the least appearance of being attacked by the fly, the heaps to windward are set on fire, brimstone is put in the fire, and thus the strong smoke which is very offensive to the insect, is wafted over the crop. If this is continued till the turnips get into rough leaf, they will be safe; but if before this, the process is stopped for five or six hours together, in a fly-working day, the crop, most likely will be lost: therefore I have not scrupled on a Sunday to have the fires lighted before the morning, and also before the afternoon service. When, some years ago, I mentioned my smoking-fly preventive scheme after dinner at our society's annual meeting, I got a little smoked myself; but having had, last year, a full crop of Swedes, which was a very rare sight, I have had the satisfaction this year (1836,) to see my plan adopted on the farm of the noble patron of our society, and on many other farms in the county. I think my smoking plan might be serviceable to protect hops from the insects which attack them. The fly commences, and ceases to commit its depredations, at such different times, in different seasons, that no one can with any degree of certainty fix the time for sowing, when the crop shall be least likely to be injured. The fly likes only the smooth seed leaf of the turnip, if that is eaten, the plant dies. When they cannot meet with seed leaves they will eat holes in the rough leaf, but they cannot thus destroy the plant. When corn crops are mowed, they will then prey on the young clover plants. No one has yet been able to prove where the fly is produced. Some assert that it comes from the earth; others that it is bred in the seed. I made an experiment two years ago, which satisfied me and all those I showed it to, that it comes out of neither. When my turnips were sown, I covered a piece of land with a large square of thin gauze, which I so fastened down that no insect could creep under it. Under the gauze, the turnips were not touched by the fly; all round it they were eaten and destroyed by it. Where the insect is generated, is not known, it flies in the air like other insects, and although it may appear strange to us, it has the power to discover that there is food for it as soon as the turnip leaf appears above ground. I have dwelt long on the cultivation of mangel wurzel and turnips; but I trust that the generality of my readers will so agree with me as to the great value of these crops as not to think me tedious.

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* With Northumberland ridges a certain degree of fallowing is carried on during the growth of the turnips. As to a broad-cast crop of Swedes, I think that quite out of the question with a good system of farming. Three pounds of seed per acre is my usual quantity. Swede turnips will keep stacked in the field very well, in not too large heaps; and I think it a good plan to have a reserve of unfrozen turnips there for sheep, in a hard frost. They will keep through a long frost by being placed in rows close to each other, with the roots cut off, the tops thus forming a pretty secure covering.

For the Farmer's Register.

MEMORANDA OF HASTY VISITS TO THE COUNTRY.

By the Editor.

Crops and farming at Shirley.

June 16th, 1837.

The crop of wheat on the Shirley farm is very fine for this bad season. That which succeeded corn, stands thin, and is much hurt by the Hessian fly. But the field on clover fallow seems not to have been materially reduced in product by that

scourge, nor by the *killing* freeze in November, and all later inflictions by cold weather and drought. Much of the crop on the richest parts is now lodged, in consequence of the recent heavy rains and winds, and cannot again rise. The preparation for this crop of the rotation, that is the ploughing in the whole growth of clover, as well as all the year's large supply of farmyard and stable manure, seems to enable the wheat to withstand all attacks, and sources of great damage, usual to the crop elsewhere, except the evils produced by luxuriance of growth. Thus the loss, in labor, if not in grain, from lodging, will be considerable this year, and is suffered, more or less, every year: and rust, coming on just before the ripening of crops of the highest promise, has repeatedly caused great losses here, when the poorer lands elsewhere generally were but little hurt. It seems to me that it would be much better to give as much as possible of the manure to the other field, on which wheat is to follow corn, which always is so inferior in product—or still better, to give it in the spring in top-dressing to the clover, which would cause an increased growth of that grass, and give that growth as a more fixed, though slower acting manure, to the soil. According to Flemish practice, and to the sound theoretical principles of agriculture, it is best always to give our farmyard and stable manures to crops of which we wish to increase the *general bulk*, and not to grain crops, or such as are valuable solely or principally for their *seeds*. The modern discovery of the economy of top-dressing young clover, or other grasses, is most important, to enable us to attend to this rule. Mr. Carter is satisfied that the better application of his manure would be in the spring, on young clover, instead of in August and September, on the same, to be covered by the ploughing for wheat. But he is still compelled to pursue the latter practice, because his rotation and general system require so much labor in the spring, that he has none to spare for carrying out his manure at the time he would prefer. This then is certainly *one* serious objection to his system, however admirable it may be in other respects. I doubt much whether his manure does not serve to increase the product of straw in a far greater proportion than of grain—and while it increases the risk of rust and of lodging, and the labors of harvest, and of thrashing, this increase of straw is of no value, except as increasing the materials for manure. This is certainly an important use; but an increase of the previous clover crop would be more manageable and profitable, and would still more be an increase of manure to the soil.

Mr. Carter still pursues, and with unabated confidence, his four-shift rotation, with three grain crops in the four years, and the general system of management described in his communication at page 132, vol. i. of Farmers' Register, and in the notes of "A Gleaner" at page 105, vol. i. The rotation then was 1, wheat, on clover fallow—2, oats—3, wheat—and 4, clover, to be ploughed under in August and September for wheat again. The only general and important change is, that corn now is mostly substituted for the oat crop—and this change was rendered necessary, not only by the loss of the diked marsh, which before yielded the whole crop of corn, but also by the want of a hoed crop in the rotation, to clean the land, which was getting foul with blue grass and other weeds. Enough of oats for a large home consumption is yet made—and this crop at first occupied a part of the shift which previously had been all given to oats—but latterly it has been found better to give to oats part of the shift which was formerly in wheat after oats, and now after corn.

Much has been said, by different contributors to the Farmers' Register, and much more might be said, both for and against this very productive and very scourging four-shift rotation. Continued success, shown in increasing annual products, and also increased fertility of the soil, both of which Mr. Carter is confident he has attained, are certainly strong evidences of the value of the system, or general plan. But I think, that the success is still more a proof that the plan, whether good or otherwise, is carried through in the best manner, in regard to good execution, and economy of labor, and other means. Three grain crops, in succession, constitute a feature contrary to all received opinions on proper rotations of crops; and besides, three grain or exhausting crops, with only one grass or meliorating crop, make necessarily a severely scourging course. Admit that—by every tillage process being well executed, and in proper time, by nearly all the clover being given to the land, and by all offal of the other crops being converted to manure—the profits and fertility are still kept on the increase—and still it may be true that a milder rotation, and more grass, or other succulent and meliorating crops in the rotation, would much more increase fertility and profits, and lessen the present heavy demands for labor. The demands of this system for labor, at particular times, are so heavy, as to leave no choice but to omit other labors confessedly of great importance to improvement—and the great toil of the clover fallow may be doubled by the uncertain, but not rare occurrence of drought, and consequent hardness of the soil. And as perfect as the tillage seems under this rotation, when *well* executed, and as clean and heavy as may be the crops, it will not bear neglect, or defective work of any kind. Imperfectly executed, the rotation would be a wretched one, both for annual profits and for improvement of the land. Neither can I believe that any but a very fine soil, having depth and good constitution, and not merely recently acquired richness, can bear up under the severe draughts made on it by this rotation. Mr. Carter, however, thinks otherwise—and that any land after being once brought to the point of producing good clover, to be turned under for the wheat, and with equal attention to manure and tillage, will improve under the rotation he follows.

Until within a week, the land here, as generally in this part of the country was suffering under severe and long-continued drought. In consequence, the oats are inferior, and cannot be made a fair crop, tho' they will be greatly improved by the late heavy rains. The clover is very poor—scarcely more than a foot high even on the best spots. But neither crop shows as badly as the corn at Shirley, which, in general, is worse, compared to the producing power of the land, than any well tilled field I ever saw at this time of the year. It has been subjected to two different and destructive visitations of insects—and the first, if not the last, is certainly owing to the part of the system but just abandoned—that is of there being no hoed or cleaning crop in the course. The field in corn has

not been in that or any other hoed crop for 12 years —and to this circumstance Mr. Carter attributes what the present crop has suffered. The first young corn, over nearly the whole field (160 acres,) was attacked by the bud-worm—which devours the bud of the plant, or the inner leaves before they are visible—and thus destroys the growing principle, and all promise of after increase, while the outer leaves are left untouched. So much was thus destroyed, or greatly injured, that forty-five acres, in one compact body, were ploughed up, and again planted—and of a large portion of the balance of the field, the greater part was re-planted; and of many acres of this, Mr. Carter thinks that it would have been better also to have ploughed up all the first planting; and of a part, he is still doubting whether it should not be done, late as it now is for another planting. But this is for the second, more than the first attack of insects. This is a new kind—or at least not before observed as a destructive enemy to corn. It is a very small beetle, about the eighth of an inch in length, of a brown color, except a white stripe running lengthwise on each of the wing cases. Its hinder legs are formed like those of a grass-hopper, and it leaps like a flea—the wings being rarely used, unless perhaps to assist its leaps. These bugs appeared in myriads, and fed upon, or sucked the juices of every part of the plants. The piece of 45 acres suffered so much under their visitation, that it was again necessary to plough it up, and to plant it throughout a third time—and this young third crop is now about three or four inches high, while some of the best corn in the field is breast high. It is to be hoped that these devastations are now over, as very few of the bugs (or "corn fleas") are now to be found. The injury to, and inevitable diminution of the crop, must be very great. This field, once yielded an average of twenty-seven bushels of wheat to the acre, of which the part on clover fallow was so much inferior to that after corn, that it was supposed that the former made nearly if not quite thirty-five bushels; and Mr. C. supposes that its fertility now would (without any disaster occurring) suffice for an average product of 8 to 10 barrels of corn. The loss that will be certainly suffered in this crop, will be a heavy offset against the advantages of the rotation, as it stood before the introduction of a corn crop.

But parts of the field of corn are as striking for its uniform luxuriance of growth, and great promise of product, as other parts are for the reverse. The soil is a brown loam, of all shades from sandy to clayey loam. The lightest parts of the field suffered comparatively but little from the attacks of the insects. The season, so far, has been very unfavorable to the growth of corn—from long-continued drought until very lately, and from unusual and continued cold since the rains fell, as well as often before. On this account, but little corn through the country, even on the best parts of fields will now average knee high—while the best of the Shirley field will average waist high, and many stalks are more than breast high. The best of all is on the ground covered with marl a few years ago, (brought by water from Coggin's Point,) twelve miles distant, at only 200 bushels the acre. This is the land referred to by Mr. Carter, in the private letter from which an extract will be given in another page of this No., and to see which, was the main object of this hasty visit of mine. Having requested, and been promised by Mr. Carter, a particular statement of his experiment, and the apparent profits, I shall say no more of it here —except, that, though the application was made under such disadvantageous circumstances as to cost him the very high price of $10 per acre in payment for digging, water carriage, and landing, and perhaps $2 more ($12 in all,) in labor, that the *nett profits* of two crops *probably*, and *certainly* of a single course of the rotation, will fully repay the expenditure, leaving the land highly and permanently improved. This cost of marling is about as much as every emigrant from Virginia to the west pays in labor, per acre, for the mere clearing the forest growth from his new land—though he may have bought the land as low as $1 25. But that expense is either scarcely counted as any thing, or is entirely overlooked, in the highly wrought anticipations of future profits. But the same persons would never have consented to pay as much, or half as much, for marling their patrimonial acres, even though they had every reasonable assurance of at least equal profits upon the outlay.

Mr. Carter never heaps the manure of the farm-yard, or stables. The very thick coat of the former, remains undisturbed, as it is left at the removal of the cattle in the spring, until when dug up and carted upon the clover fallow, to be spread ahead of the ploughs, in August and September. It is very slightly heated by its slow fermentation, though it is considerably rotted by the time it is moved away. The stable is, of course, kept well supplied with litter, and the manure, that is the wet and foul litter, is cleared out of the stalls every day, and thrown thinly over a small stable yard, where it is enough trampled to be compact, and is kept moist throughout, but never flooded or soaked by water, and never is permitted to get thick enough to heat much, while it remains there, even though a month or two may pass before it is convenient to be carried out to the field. Any such clearing out of the yard, from spring to midsummer, is spread as top-dressing on the clover field; and though the clover can scarcely be much helped by a dressing so late as June or July, Mr. C. has no fear of there being a material loss of the enriching parts of the manure, or of its not giving its proper value to future crops. This mode of management is far from being perfect—but it is conformable to the general views which I have before presented on this subject, in another article at page 170 of this number. If the main points of the true doctrine on this subject are kept steadily in view, there is not much danger from variations, and even from considerable imperfections in the practices pursued.

The Shirley tide swamp, now again under the complete dominion of the water, is a melancholy sight, compared to that which it presented when in its highest state of productiveness under cultivation. Its former state was described at length in the first volume of this journal, (pp. 106 and 129,) and its present state, and the causes, in the current volume, (pp. 40, and 41, 42.)

It would be as foreign to the object of these and similar memoranda of farming matters, as beyond my capacity, to notice and describe the mere beauties of natural scenery, or of artificial ornament. But there is one thing at Shirley which was so striking to my eye, that I will make it an exception

to this general and proper limitation. It is a growth of English ivy, which was planted, in a few small slips, 13 years ago, at one end of a tall and ancient brick building, which stands near the mansion. It has now overspread nearly the whole of the gable end of the house, has covered and overtopped the chimney, and is spreading over the adjacent parts of the sides and roof of the house. I had often before seen the ivy, when of small growth, and had thought unfavorably of it, as the green of its leaves was dark and dull, and with an appearance of white, as if mouldy—and being an evergreen, I had supposed its tints must be always less vivid than those of deciduous creepers. Such is now the color of the lower leaves of the ivy at Shirley. But after running some five or six feet from the ground, the leaves become of a beautiful glossy, and vivid green; and even their shape is so changed, that no one would suppose them to belong to the same vine. The largest of the stems are two inches in diameter, and as closely fixed to the brick wall, by their natural claspers, as if they formed a part of the building. The branches are but slightly pendent, as are those of other vines, but have enough size and strength to shoot out nearly horizontally, to as much as five feet from the wall; and over the whole space which the vines have covered, these branches form a dense and heavy mass of foliage, yet sufficiently varied and irregular in form, so as to be the most beautiful vegetable ornament that I have ever observed. And yet this is the fruit of but little time and care, and can be had wherever there is a wall for the vine to cling to, and overspread. There are two other periods when this vine must be very striking, in another way—when covered with the small and delicate flowers, which give a new tinge to the whole mass—and in the depth of winter, when the still green leaves present so marked a contrast to the naked deciduous plants. There is no modern and gay looking building which would not be increased in beauty by such light and graceful drapery as this vine would furnish—and yet, to the most massive structure, and venerable ruins, it would be still more appropriate, and add doubly to the gloomy yet highly pleasing sensations which such objects inspire.

A new marsh dike in progress.

In passing up the Appomattox, I noticed a new dike that was in the course of construction, designed to embank and reclaim a piece of marsh. It was a subject to me of disappointment and mortification, to find, (as on so many other occasions,) to how little purpose I had been for years striving to give plain instruction on this and some other points in agriculture. But upon inquiring who was the proprietor of this marsh, and designed improvement, I found that he was *not* a subscriber to the Farmers' Register. This at least relieved me of the reproach of my advice having been so little regarded by any one who had read it. Yet it is not assuming too much to say, that the dike of this gentleman, when finished, and the other works connected with it, will cost him more than would a subscription to the Farmers' Register for fifty years—and that an hour's reading of its contents on this particular subject, might have saved all the money that this scheme of embankment will cost.

SOME OF THE COMMON AND GENERAL ERRORS WHICH SERVE TO DEPRESS AGRICULTURE.

To the Editor of the Farmers' Register.

Mecklenburg, June 12th, 1837.

I have for a long time intended to contribute something towards paying off the large debt due to your valuable journal, but seeing the names of so many older and more able gentlemen among the list of your subscribers, being myself a farmer of but few years experience, I have felt a diffidence in offering my little mite. I have at length concluded to send you a few crude ideas relative to some of the causes of the present depressed state of agriculture in Virginia, hoping that with your aid, as well as the assistance of some of your more able correspondents, we may succeed in directing more of the energy and talents of our young men to the improvement of the agriculture of our native state.

That by proper legislation on the subject of agriculture, some benefit might be derived, I will not deny; (but from our legislature as at present composed, it is useless to expect any aid whatever,) yet I cannot believe that our agriculture will be generally improved, so long as all honor attaches to the learned and political professions. No parent, in the present age, thinks of employing his son in agricultural pursuits, unless he can make him a rich *gentleman*. If he cannot give him a fortune in lands and negroes, he must be made a lawyer or a doctor. How few poor young men of high standing and good education do we find engaged in farming? Any occupation is preferred to this. If they cannot be doctors or lawyers, they will seek employment as merchants, clerks, deputy sheriffs, collectors, agents, or any thing whatever, rather than as farmers. We find most of our small farmers men of no education, no talents, and of the most contracted views—upon whom all agricultural improvements are entirely lost—who farm it as their fathers taught them. The learned professions, as they are called, are crowded to such an excess, that no young man can make the interest on the capital, (which consisted, perhaps, of the whole of his little patrimony,) spent in preparing him for its pursuit. Could our young men, who are captivated by the high sounding titles and honors of the professions, witness the severe mental labor—the painful anxiety of those preparing themselves for the practice of them, they would turn at once and seek the occupation of the more humble, but, at the same time, the more independent and contented farmer, to which lot, many of our professional men have at last to come, after having spent their estates, and the prime of their lives, in vainly seeking that fame which captivated their youthful fancy.

The employment of overseers, by most of our farmers, I consider another great obstacle to agricultural improvement. They generally are ignorant, selfish, and obstinate—care but little for the interest of their employer, and are satisfied if they make large crops, no matter what permanent injury is done to the plantations on which they reside. Let any young farmer try it, and he will find, that, by attending personally to the management of his negroes and plantation, he will at least save the wages of his overseer—his negroes will fare better, be better satisfied, and, in fact, every

thing will go on more smoothly on his farm. Negroes will not do as well for an overseer as they will for their master. The employment of an overseer implies doubt of the honesty and integrity of your negroes, and they feel mortified at it, and it consequently destroys all interest they might take in what is going on, on the farm. A negro works for an overseer through fear alone; for his master, (when properly managed,) from affection and a regard to his interest, as well as fear. I have had the exclusive management of my negroes, about 50 in number, for three years, and I have had to fight but once in the time, except for little differences amongst themselves, which causes me more trouble than any thing else besides. A farmer in the county of Lunenburg, who commenced life with eight or ten negroes, and a very small piece of poor land, who is now the owner of from sixty to seventy slaves and a very fine tract of land, informed me that he had never in his life whipped one of his negroes—and a more humble, obedient and industrious parcel of negroes I never saw.

Another cause of bad management on our farms, is the custom which most of our farmers practice, of going in debt for the purchase of more land or negroes. It is almost universally the case, that when a farmer gets a little beforehand, instead of spending his money in the improvement of the land which he then owns, he will purchase more land, go in debt, cut down and wear out, until he gets straight again; and then the same course is to be followed. Inquire of any farmer you see, why he does not make such and such improvements on his farm, and he will almost invariably tell you, "I will soon; I have long intended to do so, but I am in debt now, and I must scuffle through that difficulty first." Well! he gets out of debt, and there is a little piece of land adjoining him to be sold, which he is obliged to have, or a favorite negro; and the next time you see him, the same answer is made to your interrogatory.

I will conclude this by giving a small piece of advice to the young men of the state. To every young man possessed of a small piece of land and a few negroes, no matter what his expectations may be, I would say—"Go home, settle yourself, and go to work, and you will see more real satisfaction, make more money, be more esteemed than any young doctor or lawyer in your neighbourhood."

G******.

For the Farmers' Register.

A PREVENTIVE OF THE BLIGHT IN PEAR TREES.

Prince Edward, May 27, 1837.

The preventive is the simplest imaginable—it is not to prune the tree, or break up the ground underneath them; but, on the contrary, to let the ground be trampled. The facts, from which I come to the above conclusion, are the following:

1st. There were in my grandfather's yard two pear trees, which have been bearing trees from my earliest recollection, say forty years. I am now the occupant of his houses and yard. These two trees are now as healthy as they ever have been. The yard has always been trampled by calves and horses.

2nd. There was a row of four trees in a lot adjoining the yard, which was occasionally cultivated. These trees have blighted, more or less, whenever the lot has been cultivated. Two of them have died with the blight; the other two have been several times very much injured by it, but since I have ceased to cultivate the lot, they have been flourishing trees.

3rd. I grafted in the year 1821, about twenty pear trees. They remained in the nursery until 1824; they were then planted in a lot adjoining my yard, which lot was cultivated three years in succession in tobacco. Most of the trees during those three years, blighted more or less—some blighted within a foot of the ground. I then levelled the ground on which they were planted, and moved my fence so as to enclose them in the yard. Such as had been nearly destroyed by blight, I enclosed by a pen of rails, in order to keep off the calves which graze the yard, until the trees had grown sufficiently high not to be injured by them. These twenty trees are now all healthy, and there has been no appearance of blight, since I cultivated the lot, except in one tree that was enclosed by one of my servants in a garden, in which he cultivated vegetables. That tree was blighted, and died.

I would recommend that pear trees be planted in a rich soil (I would prefer the site of an old dwelling)—that they be ploughed and worked a few years, even at the risk of blighting; and after that, that they be neither pruned nor ploughed. If they require manure, let it be applied to the surface. Ashes I think an excellent manure. Let the pear orchard be grazed by small cattle, until the trees are of sufficient size to admit of being grazed by larger, without injury. I think it would be proper to keep down coarse weeds, briers, sprouts, &c. I am well convinced that there are some hardy native pear trees, that may be pruned and ploughed without being subject to blight; but I feel confident that most of the finest kinds of pears, would thrive best under the treatment I have described. I know, too, that there is a difference in soils, and that the same mode of treatment may not suit all situations. But, those who have not succeeded in raising pear trees, might try my method. My opinion is, that the blight is produced by the excessive flow of sap, and that pruning and fallowing produce that effect. If, however, I had pear trees growing on hard poor land, I would fallow and manure; preferring rather to risk the blight, than let the tree die of poverty. But, when I had sufficiently manured, I would then cease fallowing.

HENRY N. WATKINS.

SAPLING (OR LARGE) RED CLOVER.

To the Editor of the Farmers' Register.

* * * * I hardly know what to say upon the subject of sapling clover, having heard such contradictory accounts of its value. Col. B———— informed me a few days since, that he had gathered from a poor old field at a single cutting, four thousand three hundred pounds per acre; and for that kind of land, he considered it of great value. But on rich land it would lodge, lose most of its foliage, and in some instances rot. This is the opinion of almost all with whom I have conversed upon the subject—there are, however, a few who object to it *in toto*, believing it inferior to the other, however favorable the soil.

When it is desired to sow timothy with it, I should think it much preferable to the other, when the land suits, as they ripen together. I have never heard any objection to it on account of its coarseness, except from those who have never cultivated it. I am informed that cattle eat it with sufficient avidity. I should think it a better improver than the other kind, when a crop of hay is no object. Much more might be said upon the subject, but I am no essayist, and have my information second-handed. I was in hopes your experience in the cultivation of it, would have rendered information upon the subject unnecessary.

———.

EXTRACTS FROM PRIVATE CORRESPONDENCE. DIFFERENCES OF OPINION, AND PROCEDURE, AND COMMENTS THEREON.

Fairfax, June 12th, 1837.

* * * * * *

I cannot close this without grateful acknowledgments to you for the information I received in the value and use of calcareous matter upon our land. I am using 12 to 15 thousand bushels of oyster shells per annum with marvellous success; but, as I cannot write over my proper name, I feel that I am not at liberty, in self respect, to give you any account for publication. Let it suffice, that I give $50 per thousand bushels for the shells, and take them on board the craft; and I then have to cart them from six to eight miles.

We have often urged on our correspondents the importance to the public, and to the proper appreciation of the value of their communications, that they should sign their real names to statements of matters of fact, as the respect paid to them, of course, must rest on the name of the writer, except so far as the character of the journal for which be writes may serve as a voucher for respectability. But, though greatly preferring the form of *avowed* to *anonymous* communications, (of matters of fact, and not of reasoning,) we never designed to discourage the latter—and, in this case, we assure our much respected correspondent, that his communications, though anonymous, have always been welcome—and that if he will hereafter furnish a report of the expense and profit of his liming, executed under such unusual disadvantages, (though he may still adhere to his *incognito*,) it will be highly acceptable to us, and doubtless of value to many readers.

Charles City, June 10th, 1837.

* * * * * *

The effects of the marl which Mr. ——— delivered me some few years ago, from your marl banks at Coggin's Point, are so great (in fact they surpass every thing in the shape of manure I ever saw, or could conceive), that I should be very glad to procure more of it, and would be very much obliged to you to assist me in getting some good honest person to deliver me from five thousand to ten thousand bushels per annum, for five or six years, until I shall have marled my whole plantation. I would give five cents per bushel for marl like that before brought, to be delivered on my land, at the most convenient landing for the lighter; and I would build a convenient stage, (or wharf,) on which to throw it from the lighters, at my own expense, if necessary. If you could contract with a suitable person for me, I would be very much indebted to you to do so immediately; or, if you could even recommend some one to me, I should be very much obliged to you.

Did you ever know such a drought in the spring before? Every thing here, on that account, is in a desperate state, except where the land is marled.

We shall endeavor by future and suitable arrangements to have our friend accommodated; and at a less cost than he is now willing to pay. For though he has the best possible proof that he can afford to give the price named, for water-borne marl of the best quality, we are equally sure that it may, by proper arrangements, be dug and transported for much less; and under this impression, we had before advised other applicants, who were willing to pay more, to wait for better arrangements, and a consequent lower price for delivering this manure.

———, *June 9th,* 1837.

* * * * * *

I soon discovered, with much regret, after the commencement of the Register, that I differed widely with you as to the most beneficial mode of conducting it; and more recently, on the principles on which you expect to improve the agriculture of Virginia. But you are, I conceive, like myself in one respect at least. You do not sacrifice your opinions to politeness, nor would I give a fig for any man who did. Yet, in my opinion, the publisher who, at this period of the world, is most likely to increase the knowledge of mankind on any subject, is he who *selects, condenses* or *compiles,* and not he who gives you a bushel of chaff, in which you may find three grains of wheat. In this respect, the Penny Magazine is above all praise. I could never satisfactorily discover why you were opposed to inserting in the Register extracts from standard books, or even the whole of them. If Sir Humphrey Davy's Agricultural Chemistry, exclusive of the Appendix, or Cobbett's Gardening, &c., &c., were inserted in a volume of the Register, I should think it well worth binding after it had been read.

I am under serious apprehensions that the marl banks in lower Virginia, will be as injurious to its agricultural, as the paper banks to its commercial prosperity. After having used, (on a most insignificant scale, to be sure,) shell lime, (not marl,) for about fifteen years, I am induced to suspend, believing that I had begun to discover that similar effects to those in England, where "many thousands of acres, in every part of the kingdom, have (by the use of it) been reduced to a state of almost perfect infertility," were likely to be produced. * * * * * *

The last extract is from an old and esteemed friend, who has been a subscriber to this journal from its commencement—and we have received these and some previous strictures from his pen, in perfect kindness of feeling, and we take the liberty of publishing them here the more willingly, because we can truly declare that he is the only one of our subscribers, who during our whole editorial course, has expressed to us censure, of any kind, to any extent worth consideration. No doubt there has been enough ground for censure, both real and supposed—but it has not been ex-

pressed to us—and therefore we the more value this frank reproof, and regard it as the act of a friend. But, in the same spirit of frankness, we mean to defend our course, where we deem our correspondent's censure misapplied.

It may not be so plain to other readers, as to us, from prior knowledge of our friend's views, that one opinion of ours which he refers to, and dissents from, is the *propriety and necessity of the knowledge and improvement of agriculture being promoted by legislative enactments and bounty*. Our views on this subject have been so often urged on the public, that it is unnecessary to say any thing of them here; but, in future, believing that all expectations of such aid from the legislature of Virginia are altogether desperate, our *practical course* will hereafter agree very nearly with our friend's; that is, we shall certainly never again *ask* of the legislature any thing of this kind, which he would continue strenuously to oppose.

Next, as to the manner of filling our pages. If we were to please our correspondent by republishing many entire, though valuable books, we should certainly displease the greater number of all other readers. The most intelligent and curious, and zealous agriculturists, would probably possess most of these works already—and most others would not care to read them. For our own part, such a plan would relieve us of much labor and care; and it would also be deemed of value to the public, if confined to valuable works, either out of print, or very rare in this country. Such a case is presented in one of the works above named (Davy's Agricultural Chemistry,) for a republication of which, with the additions and alterations required by the progress of chemical and agricultural discovery, arrangements have already been made.

But as this kind of matter would lessen our labor, so the other course recommended would incalculably increase it. We now are oppressed with the multiplicity of duties, made necessary by the want of that proper *division of labor*, and *combination of effort*, of different individuals, so requisite for the whole business of a publication like this; and we are ready to acknowledge that confinement to mechanical and office drudgery, leaves far too little time for the proper performance of the more important editorial duties. And how much greater would be the deficiencies, if the mass of matter usually presented, was *attempted* to be refined, condensed, and reduced to its best and most valuable parts, and presented in new language? The Penny Magazine probably has its editorial and mechanical and business departments sustained by the combined abilities of fifty individuals, each carefully selected for his particular duties—and the expense of this labor is supported by the money of more than 100,000 purchasers of the work. We need not contrast with this, the comparatively small support, pecuniary and literary, afforded to the Farmers' Register.

But this is not all. Many readers might object to have thrown aside what our correspondent considers as mere "*chaff*," and might often value it more than the few "*grains of wheat*" which either he or we might save from the winnowing process. Opinions, instructions, and even statements of facts, which one reader might highly value, might by another be held in supreme contempt. How then, could any individual, if an hundred-fold more highly gifted than we can dare pretend to be, decide on what would be most pleasing, or most useful to readers? It is necessary, in an agricultural journal, to admit all opinions from respectable sources, and leave readers to judge of their comparative worth.

In our correspondent's opinion of the ill effects produced by "paper banks" in this country, we can heartily concur—and fear that the damage yet to come is even greater than that which the country has already endured. But, our concurrence never can extend to the effects of "marl banks"—and we are curious to learn, and should be glad to have for publication, the grounds on which he builds his opinions. We know that he resides in a county where some of the greatest benefits of marling have been realized—at least, such is the belief of our correspondent's intelligent neighbors, who have had enough faith in its value to try the use of marl. If it is possible that we are all wrong who believe that we have greatly improved our lands, increased our annual profits, and the permanent value of our estates, by marling—and especially for some of us who have been nearly twenty years under this delusion—it is very important that the correction should be afforded by our friend, and we earnestly hope that he will not withhold from the public his views on this subject—which we are very sure that he will never change.

Philadelphia, June 24, 1837.

For the last two or three weeks, we have had constantly showery weather, occasionally hot, but generally cool. Unless a favorable change takes place soon, there is reason to fear much hay will be damaged. All that is cut, will of course, be more or less so; and that which remains uncut will soon begin to receive injury, I fear. Of course I allude to clover—timothy not being as yet fit to cut. The weather is very favorable for the oat crop; but I entertain fears that it may prove injurious to the wheat.

Potatoes, generally, look very well, and the corn is of a good color. If not too late for your next number, urge in it the attention of your readers to the growth of ruta-baga. July is with us the proper season for sowing them. The culture of turnips is gradually extending over several districts in our state and New Jersey. Where a knowledge of the real value of the crop is principally obtained, there is little or no danger of its culture being abandoned or neglected. On a part of Mr. W——'s crop last year, there was a manifest advantage resulting from the application of a small quantity of lime, say about ten or twelve bushels per acre. It was spread on the ground after the seed was sown, being in a well slaked state, fine powder, it was spread evenly from the tail of a cart with a shovel.

My impression was that on the part where used, the weight of turnips was 50 to 75 per cent. greater than where none was applied.

I thought an increased quantity, say 18 to 20 bushels would have produced a greater effect—but this is mere matter of opinion.

MONTHLY COMMERCIAL REPORT.

The present month has brought no alleviation of the distress which seemed to have reached its crisis when the suspension of specie payments took place, six weeks ago.

In Virginia, there is almost an utter annihilation of commerce. The few hogsheads of tobacco which are sold at the inspections, comprise nearly all the trade that is visible. If an embargo existed, our exports could scarcely be less than they have been during the present year. A few foreign vessels have been loaded for foreign account, and it may be worthy of remark, that foreign shipping has superseded our own to a very great extent. Of 100 vessels at New York, put up for foreign ports, only 34, (including nine regular packets,) are American. The purchase, as well as the transportation of our produce, appears to be getting into foreign hands. Our commercial resources are, for the present, destroyed, and American enterprise must strike its flag to those countries which abide by experience in preference to experiment. The extraordinary state of commerce and exchanges which now exists, will scarcely be believed some years hence. As for example, take these extracts:

Washington City.—"The citizens have applied to the banks, requesting them to pay specie for $5 notes, for the purpose of procuring change for marketing, &c." "Specie is 10 per cent. above district notes, and these are 15 to 25 per cent. above the notes of the southern and western banks; consequently, the latter are 25 to 35 per cent. below specie."

Mobile.—"The suspension of specie payments leaves us no medium of foreign or domestic exchange, except cotton and other produce; and from this cause, and the depreciation of paper, compared with specie, all articles of produce have risen. Notes of New Orleans banks, or checks on them, are saleable in Mobile at 10 per cent. premium, and cotton is now shipped from Mobile to N. Orleans as the only medium for the purchase of provisions, which are enormously high at Mobile."

In *Louisville, Kentucky*, the notes of the Missippi banks are at 20 to 25 per cent. discount, while in New York the notes of the Kentucky banks are at 10 to 15 per cent. discount—those of Georgia and South Carolina at 10 to 15—of North Carolina, at 10, and of Virginia, at 5, in exchange for N. York notes, which are at 12 per cent. discount for specie. Exchange on London, 20 to 22 per cent. premium, for New York notes. Thus, the various exchanges on $100 from Mississippi to Kentucky, thence to New York, and there converted into dollars would leave not quite $60 in specie. Such a state of things must cut off nearly all intercourse between different parts of the country—indeed, it is now impracticable to obtain small change in Virginia for ordinary expenses. The payment of taxes will be attended with great inconvenience, and the payment of duties is rendered impracticable.

In some places two prices are now paid on articles sold—the one for specie, the other for notes, or small bills, which are generally introduced in the northern states, though prohibited by law in some of them.

That the present distress and prostration is not confined to the Atlantic portion of the country, but pervades the fruitful west, the following extracts will show:

"The number of steamboats out of active employment on the Ohio river, between Louisville and Pittsburg, is 125." "On the Pennsylvania canal, one transportation line has withdrawn its boats and teams for want of employment, and the state treasury of Ohio has to supply a large deficit to pay the expenses of her canals."

The destruction of confidence on both sides of the Atlantic, has compelled the holders of cotton in N. Orleans to place it under the control of banks for exportation, to be accounted for when sold by their agents in England. Importations of foreign grain continue, and the price has advanced, partly owing to the depreciation of our currency. The following report of sales in New York will show the relative estimation in which different sorts are held:—9000 bushels of Russian, small grain, at $1 12½; 5000 bushels good red German, at $1 15; 10,000 bushels good Trieste, at $1 35; 5000 bushels white Dantzic, at $1 50; 4000 bushels very prime Rostock, at $1 75. Foreign rye 85 to 90 cents. Delaware yellow corn, $1 03. Southern oats, 51 cents.

There are no transactions in our own markets to furnish quotations of wheat. The crop now about to be harvested, will, should the weather be favorable, prove fine in quality; but the quantity sown was unusually small, and the growth in most parts is thin. Corn on the rivers 80 to 85 cents.

No sales of cotton have been made in Petersburg, except for the use of mills in Virginia—price, 7 to 10 cents.

The legislature, at its late extra session, has released the banks from the disabilities they incurred by the suspension of specie payments, but has refused to permit them to issue notes of less denomination than five dollars.

In our own stocks there are no operations by which to furnish quotations. In New York and Philadelphia, rail road stocks seem to be more in favor than those of any other description.

X.

THE VIRGINIA LEGISLATURE—THE STAY-LAW—AID TO AGRICULTURE.

The legislature of Virginia, at their late extra session, without much opposition, or the time usually spent in debate on very trivial matters, have passed a law which virtually compels all creditors to receive the notes of non-specie-paying banks, for debts already due in gold and silver. As the irredeemable paper currency was then 10 per cent. below the value of specie, this legal measure is neither more nor less than an actual confiscation, or sponging, of one-tenth of the amount of all the debts due in Virginia. This is not the place to discuss the constitutionality, or the morality, or policy, of this measure—and however enormous may be its evils, we are not prepared to say that some such relief to debtors, though by a sacrifice of the strict rights of creditors, was not made absolutely necessary by the present general and calamitous condition of the currency and trade of the country. But we desire our readers to contrast the ready zeal and perfect coolness with which this measure of widespread confiscation has been enacted by the legislature, with the morbid sensitiveness of the same body, in all

supposed cases of rights being touched by attempts to aid or improve agriculture by law. This very body, last winter, refused, (on *principle*, forsooth,) to vote even the pittance required to establish a Board of Agriculture—upon the ground of "*let us alone*"—a true and valuable doctrine indeed, but which is often quoted but to be grossly misapplied. And if it had been proposed to this body to enact a legal and efficient *permission* to the owners, to drain, and make heathful and fruitful, the extensive swamps of Virginia, or to *compel* the laying dry of pestiferous and *useless* mill ponds—though with every reasonable expectation of benefit to each of the individual owners, as well as to the community in general—the legislature would have evinced their usual holy horror at such attempts to "invade the rights of property," and probably neither measure could have commanded the support of thirty votes.

SEASON AND CROPS.

Since our last month's report, we have heard but little of the wheat crop, and nothing favorable of it, from correspondents. But judging from our own limited observation, and from verbal reports of the neighboring country, the considerable improvement of appearance and prospect which was then stated, has continued to advance to a remarkable extent. Where the Hessian fly has not been very destructive, the other previous disasters may not prevent such crops *approaching* an average product. But all dangers have not yet been passed. The harvest is late in commencing, and generally, hereabout, is yet to begin; and since the earliest commencement, (say June 12th,) there have been frequent and heavy rains. The weather has been remarkably cool for the time of year, generally, and particularly so for some weeks just passed, until the 25th—and now, on the 26th, the air is so hot, as well as damp, that all wheat not matured is yet in danger of rust—which would have been experienced already, and generally, if the weather had been ordinarily warm, during all the late rains. The early crops of wheat of course are safe from rust, and have been already mostly reaped. They also, however, must have suffered from the rains greatly affecting harvest labors, and endangering the security of the ripe grain. The quality of the grain, so far, is excellent.

The present weather, which is so unfavorable to wheat, is very fine for the corn—and almost the first very good weather which it has had during its growth. Oats also, though almost in a hopeless condition until after the beginning of June, have been so greatly favored since, as now to promise good returns.

27th.—Last night, another heavy rain—and the air still very sultry.

A letter from Fairfax, dated June 25th, just received, gives this confirmation of the general late commencement of the present harvest. "I have generally commenced the harvest of early wheat from the 12th to the 14th of this month; this harvest will not be ready before July."—The harvest at Coggin's Point farm, of mountain purple straw wheat, on marled land, was commenced as early as the 16th; though of many crops in the same county the reaping has not yet been begun.

A letter from Goochland, just received, states that the wheat on *good lands*, has so much improved lately, that "the product will not fall much short of an average." A gentleman from Halifax county, makes a similar, or even more favorable report, of the wheat on *good lands* in that county.

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